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Average Automobile Dealer is Not Effective as a Parts Wholesaler

by Norman G. Shidle

CURRENT protests from car dealers against giving discounts on parts to independent repair shops should make vehicle manufacturers stop short in their routine thinking about selling "original" parts.

Clear thinking about the protests should carry every vehicle maker into realms of study and foresight far beyond the mere question as to whether or not the average car dealer can be made into an effective parts merchant.

Up to the present time the indicated answer to that particular question is: "No, the average dealer cannot be made into an effective parts wholesaler." Certainly, he has not been in 99 per cent of the instances in which it has been tried.

The main reason for his failure as a parts wholesaler, perhaps, is his lack of interest and his failure to see any real profit opportunity for himself in developing along these lines. And the average dealer just doesn't see any real advantage to himself through selling parts to independents.

Furthermore, evidence of this comes from the 460 answers just received by *Automobile Trade Journal* from dealers, widely scattered geographically and as to makes handled, to the question: "Do you think car dealers should give independent repair shops a discount on parts?"

Sixty per cent answered, "No." Forty per cent answered, "Yes."

But when one reads the comments which came with the "Yes" votes one is left with a clear understanding of the fact that, in practically every case, the "Yes" was merely a lack of serious objection to the practice—not in any sense the expression of an enthusiasm for it. The result of this particular poll could be recorded more accurately, we believe, by saying that 60 per cent of the dealers are opposed to allowing discounts to independents and 40 per cent don't see any special harm in it.

Now all of this simply supports the original thesis set up in our opening paragraph that clear thinking about this current problem must inevitably lead the mind of the executive in car, truck and parts factories far ahead into the probable fundamentals of future parts merchandising problems.

This thoughtful look ahead by executives is bound to be taken from three specific viewpoints depending on the type of factory with which the executive is associated.

There will be the viewpoint of the parts maker engaged only in selling for replacement, that is, *the independent parts maker.*

Then there will be the viewpoint of the parts maker who sells both for original equipment and for replacement, that is, *the vendor manufacturer.*

Finally, there will be the viewpoint of *the car or truck manufacturer.*

The view of the first group need have few complexities. The independent parts maker sells through wholesalers to vehicle dealers and independents alike and has no interest in life except to sell replacement parts. He would rather that the vehicle manufacturer and dealer did not give discounts on "original" parts to independent repair shops, but is only mildly concerned in the matter because to date his sales haven't been materially influenced by this practice one way or the other.

Concentrating entirely on replacement parts sales and making his entire profit from that source he has

thus far been able to meet the competition of the car manufacturer as regards price and quality and to beat it by a wide margin as regards availability of supply, promptness of delivery, effectiveness of service *and availability of credit* in connection with parts purchases. Generally speaking, he feels that he can continue to do business along present lines indefinitely in the future—and nothing appears on the immediate horizon to indicate that he isn't right.

The vendor parts manufacturer, selling both for replacement and original equipment, has fairly definite ideas about the future, but realizes that his own plans will be modified and adjusted gradually, depending largely on what the vehicle manufacturer does.

Hence, the viewpoint of the vehicle manufacturer about future parts distribution policies involves the possibilities of more radical change—as even of complete upheaval—than does that of either of the two other groups.

And among car executives who have been studying the parts problem carefully in a broad sense some very radical speculations about the future are to be heard from time to time.

To Be Considered

These radicals are still in a small minority, but their voices are to be heard more and more distinctly as one expedient after another is tried and found wanting. These radical voices, when they are heard, do not speak with finality of what must be done. Their radicalness lies chiefly in the fact that they keep insisting that certain existing facts must be recognized in planning fundamental parts merchandising plans for vehicle factories. Among the existing facts which they keep repeating must be recognized are:

1. Car dealers can never get all repair business into their own shops.
2. The dealer must carry a bigger parts inventory if he uses "original" parts exclusively than if he buys heavily from nearby jobbers; because the best car factory parts distribution does not make parts available to the average dealer as readily as does the average jobber distribution system.
3. The average car dealer won't merchandise parts to independents, regardless of discounts.
4. The average car dealer wants to buy from jobbers or anywhere else he pleases, but objects to the factory selling to independents or anywhere it pleases.
5. Economic, profit-making possibilities—not arbitrary enforcement—will make any parts selling policy stand or fall in the long run.
6. To get the parts business from the independent parts maker, the car manufacturer must find some means of outmerchandising and outservicing the independent.

Around the last of these items, of course, centers the main controversy. Some of the radicals in car ranks are even asking:

"Isn't it perhaps impossible for a single car manufacturer to outmerchandise and outservice the independent parts maker who makes similar parts for various cars and whose wholesalers stock parts for all cars?

"Can a manufacturer of parts for a single car afford a distribution system which may become economical only if set up to serve many cars?"

From within car manufacturer ranks themselves has come the suggestion that car manufacturers might be much better off if they simply stopped making parts for any model which was more than three years old and actually urged their own dealers to go to jobbers for all such parts as they needed.

Another speculation from the ranks of the radicals suggests cooperative parts merchandising by groups of car manufacturers. Such a group might set up a separate company which would function exactly as does the independent parts manufacturer today. It would sell either through established jobbers and wholesalers or through similar units of some kind. It would be the sole source of supply as well as the sole merchandising force for the parts for cars made by this group of manufacturers. United Motors Service already functions in about this way in the distribution of most of the accessories made by subsidiaries of the General Motors Corp. Where parts in these particular makes of cars were duplicated in makes outside the group, the group merchandising company, selling through wholesalers, might take some of that business from their individually operating car competitors just as the independent parts makers now take some of that business from all car makers.

Or such a cooperative company might even make a full line of replacement parts for all cars.

Growing out of this same line of thought, but supposing cooperation between companies to be difficult of accomplishment, is the suggestion that some car makers in the future might actively work with certain independent parts manufacturers, definitely making those particular independents the parts supply and merchandising sources for their particular parts.

Such speculations will be considered entirely out of order today by a large proportion of car factory sales and general executives. There is no question about that. Yet undercurrents of thought and study indicate strongly that some coordinated merchandising of parts by a group of car manufacturers will come about within ten years at most and quite conceivably within one to five years.

Should this prediction turn out to be true, the parts merchandising problem of the remaining individually operating car companies would be made far more acute than it is today, provided no fundamental changes in their operating policies were worked out in the meantime.

Cooperative Distribution

We would then have a situation where one group of car manufacturers through a centrally operated parts merchandising organization, devoted exclusively to one task, would be:

1. Actually merchandising parts to its own dealers with all the vigor, availability of merchandise and service of the regular wholesale distribution set-up;
2. Doing the same sort of merchandising to independents on a basis which might be definitely competitive with independent parts makers clear through the wholesale and retail field on every basis;
3. Merchandising certain interchangeable parts to competitive car dealers.

Two major factors at present tend to inhibit too fundamental thinking among car factory executives about the future in parts merchandising:

One is the profit that already is being made from parts sales; the other is that general sales executives fear that too active general merchandising of parts might antagonize certain dealers and upset the sales apple cart.

These are both very real and practical considerations and quite properly will and should prevent any hasty action along purely parts selling lines. It is the belief of those who have been studying the parts situation very closely, however, that these two factors should

not inhibit long-range *thinking* on this important subject.

Immediate action is one thing, this group points out; long-range planning is another.

In practically every vehicle manufacturing company there has been unusual concentration of attention on parts problems during the last year or two; there has been unusually close study of existing problems; and there has been unusually active effort put on those problems.

But out of all that study and activity have come thus far only changes in procedure; changes in fundamental policy have been negligible.

Changes in procedure have helped greatly to improve individual situations, and coming changes will help more. We would be evading our function as a business publication, however, did we fail to broadcast at this time the fact that possibilities of fundamental policy changes are brewing in certain parts of the industry which, if they should come to fruition, will change materially the conditions in which current procedure would be functioning.

Current German Aircraft Engine Research

RECENT research work in the engine department of the German Aeronautical Research Institute is reported upon in *Die Luftwacht*.

Work in the field of vibration research covered both theoretical and experimental investigations, as well as the development of measuring instruments. In the course of the year measurements of torsional vibration were made on several carburetor and Diesel engines. Through the acquisition of a suitable testing stand it was made possible to test torsional vibration dampers under the same conditions as in flight.

In connection with this work the mode of operation of frictional dampers was investigated, and the effects of cylinder number, cylinder arrangement and timing order on torsional vibration in crankshafts were determined. The development of the D.V.L. torsiograph, a robust instrument which can be readily applied to any engine, was completed.

This instrument was also built in a small and handy form, to permit of obtaining accurate records of torsional vibration from engines of small output. Development of a torsion indicator for the determination of stresses in long transmission lines due to vibration was begun. Such transmission lines bid fair to play an important part in aircraft in the future.

In the field of thermodynamics, knowledge regarding combustion phenomena was added to by the development and the extension of the field of application of the electric indicator. The mechanical method of indication with the D.V.L.-Ritz indicator was developed further. Indicator diagrams taken on a number of engines at high pressures and high crankshaft speeds gave information concerning mechanical and thermal working stresses.

Aside from being used for pressure measurements, the electrical indicator was used also for the determination of rates of flame propagation and of ignition temperatures in the engine cylinder. Measurement of rates of flame propagation yielded accurate information regarding the phenomena occurring in a detonating cylinder, so that the nature of detonation can now be clearly explained.

Experiments were undertaken with direct injection of light fuels by means of injection pumps and nozzles. Application of this process to aircraft engines is particularly promising in connection with the development of two-stroke engines, offering advantages of lower fuel consumption and smaller fire risks. Fundamental research work regarding the possibilities of application and prospects of development of this process were started on a two-stroke experimental engine.

Experiments relating to improvements in the air-cooling of aircraft engines were continued. Of other projects there should be mentioned tests of engines cooled with high-boiling-point liquids (ethylene glycol), which are of interest on account of the reduction in radiator weight and of the air resistance due to the radiator, and investigations concerning the influence of air temperature and humidity on the output of air engines. The instrumental equipment of the engine-test plane HD-44, a flying test stand, was completed, and tests of engines in flight were begun.

In the field of general research on engines and drives the Institute carried through a more important project relating to the development and the principles of layout of liquid-cooled engines which was based on both theoretical and practical considerations. Trial runs were made with several new engines to determine the effect of the load factor on the reliability of air engines.

In the field of Diesel aircraft engines the activities of the engine department were confined to consultation work and to participation in tests, etc., carried out by the industry, as the test equipment for single cylinder tests is not yet completed.

Particular attention was given to the problem of fire protection, and investigations were made concerning the separation of the engine compartment from the interior of the plane by fireproof walls.

TATRA WORKS of Prague, Czechoslovakia, has taken out a British patent on a six-wheeled type of motor vehicle with gas-electric drive and the tubular backbone-type of frame. An internal combustion engine with direct-connected generator is mounted at the forward end, and the housing of this power unit and the two differential housings are rigidly connected together by seamless drawn tubes of comparatively large diameter, the various parts being flange-jointed. The electric motor through which the two rear axles are driven is flange-mounted on the rear of the rearmost driving axle. The driving axles are of the oscillating type.

AMONG recent publications of the U. S. Department of Commerce is the Report of the Twenty-third National Conference on Weights and Measures, which was held at Washington, D. C., June 3-6, 1930. Copies of the report can be obtained from the Superintendent of Documents, Washington, at 35 cents each.

Truck Rating System Should Include

Photo by Geoffrey Grier

The importance of gross vehicle weight is questioned + + + + + +

THE decision of the Society of Automotive Engineers to look into the subject of a standard rating formula or a method of rating for trucks undoubtedly is of great interest to every one engaged in the commercial vehicle industry. Several illuminating examples of the extremes in rating practice were mentioned in Mr. Pulcher's paper, read at the recent summer meeting.

Up to now the S.A.E. has been rather averse to standing back of proposed standard methods of rating, such as horsepower ratings for engines. One reason for this has been that the specific output of engines has been increased at such a rapid rate that any method of rating based solely on the physical dimensions of the engine would have become obsolete in a few years. With an engine, moreover, it is easy to determine the horsepower which it will develop, and the manufacturer can be guided by brake tests. There is, however, no similar method for determining the maximum safe load of a truck.

The possibility that a truck-rating formula adopted at the present time may no longer fit conditions five or ten years hence is hardly a sound reason against the adoption of such a formula, for practically all of the standards of the S.A.E. have required periodical revision to keep them in accord with changing conditions.

When an analysis is made of present-day rating practice, it soon becomes evident that two distinct conceptions of truck rating prevail. We have, in fact, what may be called light-duty and heavy-duty ratings. The distinction is perhaps sharpest in the 1½-ton class, in which chassis are offered that range in weight all the way from about 2400 lb. to more than 5000 lb. One group in this class averages less than 3000 lb. chassis weight, the other 4000 lb.

The lighter of these trucks are used for the most part in store delivery work, where loads are generally small, and the load rating is regarded as the limit of useful load the truck should ever be called upon to carry. The heavier trucks, on the other hand, are used more in such services as the transportation of building material, coal, etc., where there is a full load practically every time; they are supposed to carry their rated load practically continually and to have a certain overload capacity.

This division into light-duty and heavy-duty trucks does not seem at all illogical, as it is based on service conditions. We have a similar practice in connection with internal combustion engines. So long as the majority of our roads were in bad condition it was not possible to drive a passenger car at its maximum speed (thus putting the engine under full load) for more than a few minutes at a time; in fact, the engine generally was fully loaded only in ascending grades.

These passenger car engines were rated at the maximum horsepower they were capable of develop-

Tractability, Tire and Chassis Capacity

by P. M. Heldt

ing, but when it was attempted to use such engines in services in which they had to develop from 75 to 80 per cent of the maximum power continuously, as in tractor or marine work, it was generally found that their life was very short. This led to the production of a special class of heavy-duty engines. In recent years, as our roads have been gradually improved and high-speed travel over long distances has become possible, passenger-car engines have approached the heavy-duty type in design.

In discussing truck ratings the "maximum safe load" seems to be a very appropriate term, but it must not be overlooked that in any particular case this maximum safe load depends not only on the truck itself, but also upon the roads over which it is operated and the manner in which it is driven, that is, upon the operator. It would seem that the only way in which some account could be taken of these last two factors would be by having a heavy-duty rating and a light-duty rating.

One question, then, that would seem to have to be settled would be whether there should be two types of rating—a light-duty rating, representing the absolute load limit, and which the truck is supposed to carry only under favorable conditions, and a heavy-duty rating, which represents the normal load which the truck can carry continuously, even under more or less adverse conditions, without sacrifice in life, and which may be exceeded under favorable circumstances; or whether there should be only a single rating.

Value is Not Measured Alone by Capacity

One point that it is well to bring out here is that the monetary value of a truck—as measured by its cost of construction—is not dependent upon the load-carrying capacity alone. The speed of the truck is a factor of almost, if not quite, the same importance from this point of view. For instance, the suggestion has been made that we base the rating of a truck upon the maximum gross weight which its powerplant is capable of moving up a certain grade in high gear. If such a rating were adopted, a mere change in the rear-axle ratio of, say, from 6 to 1 to that of 8 to 1, which should occasion no change in the cost of production, would increase the gross-weight rating in the proportion of 6 to 8, or, say, from 12,000 lb. to 16,000 lb., and increase the pay-load rating by 4000 lb. It is still essentially the same truck, however, and what has been gained in load capacity has been lost in speed.

Fundamentally, there are two kinds of limitations on the maximum safe and practical gross weight of a commercial motor vehicle. For instance, if we take an average truck rated at two tons and load it with four tons or more, we probably have no difficulty in moving the load over hard, smooth, level roads. We will soon notice, however, that the truck does not handle well. It is very sluggish, or, in other words, it does not accelerate well, and as soon as the least grade is encountered, gears have to be shifted. In short, the vehicle does not have the "ability" that is expected of a modern truck.

If, in spite of this, the overloading is continued, it will be found that various parts give out prematurely. The tires will not give the service that one may expect under normal conditions, and there may be failures of frames, springs, axles, etc. In fact, such failures are almost sure to occur if the truck be overloaded so heavily time after time.

Capacity is Dependent on Three Factors

The capacity of the truck, therefore, depends upon ability of the powerplant, in conjunction with the gear reduction used, to move loads, and upon the ability of the supporting parts to carry loads. The supporting parts may conveniently be divided into two groups—the tires and the metallic parts of the chassis.

If a rating formula were based solely on the ability of the engine, transmission, etc., to move loads, it would have the effect that trucks would soon be greatly overpowered. If the nominal capacity of a truck could be increased 50 per cent by merely providing it with a powerplant of 50 per cent greater output, that would evidently be an easy and inexpensive way to obtain trucks of higher capacity. But such trucks would not be balanced in design, and the effect of such a rating formula on design tendencies could not fail to be harmful.

Similarly, if trucks were to be rated merely in accordance with the rated carrying capacity of their tires, the result would be over-tiring.

It is comparatively easy to get at the approximate capacities of the powerplant and the tires, but it is difficult to determine the relative capacities or strengths of the other supporting parts, including the frame, springs, axles and wheels. The only simple index of the capacities of these parts that the writer can think of is the total chassis weight. It is obvious that if the same materials were used and the same degree of skill brought to bear on the design, the carrying capacities would be substantially proportional to the weights of the chassis.

Against this it might be argued that if we assumed materials and standards of design to be uniform throughout, then the load rating could be based on any single item, such, for instance, as that of tire capacity, which in the foregoing was declared to be unsatisfactory.

Figures quoted in the papers read at the S.A.E. summer meeting showed that for the same load rating, chassis weights will vary within very wide limits, which might be considered to be proof that chas-

sis weight is far from being a measure of actual carrying capacity. But, as already pointed out, the great variations in the weights of truck chassis of the same rating are due mainly to differences in conceptions as to what the rating should express. Differences in the mentalities of the persons determining the rating undoubtedly play a larger part than differences in materials used and differences in design. Color is lent to this impression by the known fact that in many cases trucks which are among the heaviest for a given rating also embody materials and features of design of the highest grade, and which naturally tend to bring down chassis weight.

If the rating is based on the total weight of the chassis there is no reason in the rating method why one particular part should be skimped. The effort of the designer naturally will be to make all parts as nearly equal in strength or in carrying capacity as possible, so the factor of safety will be about the same. This statement, of course, must be interpreted in a very general way. For instance, in some cases it is rather desirable to have the parts very rigid, in order that other parts dependent upon them may function properly, and in that case the safety factor based upon the breaking strength may have to be exceptionally high. The factor of safety then should be based upon the maximum permissible yield or elastic deformation, rather than upon the maximum permissible tensile, torsional, compressive or shear strength. Of course, mistakes in design will occur, but, if glaring, they will soon be corrected, and, in any case, the ideal of a uniform factor of safety throughout can never be fully attained.

The subject of "ability" was excellently handled in the S.A.E. paper by Mr. Buckendale. If it is assumed that it is desirable for a truck to be able to carry its maximum rated gross weight up a grade of 4 per cent in high gear, then the piston displacement of the engine, the total reduction in direct drive and the wheel diameter at once give the maximum gross weight which the truck is capable of handling. I notice that Mr. Buckendale has taken account also of the compression ratio, and while this tends to add to the precision of the rating, I doubt whether it is necessary to go to this degree of refinement for a commercial rating.

Compression Ratios Vary

This view is based on conditions that have ruled in the truck industry in the past, when all engines were built to use the same fuel and otherwise also were subject to the same limitations on compression ratio. In view of the fact that in stock passenger car engines compression ratios now range from 4.22 to 6, it is not impossible that in the future we may have a similar spread of compression ratios in truck engines, which would fully warrant taking account of the compression ratio in determining the ability.

The gross weight rating of the truck, based upon the tractive ability, then, is proportional directly to the piston displacement of the engine and the reduction ratio between engine crankshaft and road wheels, and inversely to the driving-wheel diameter. The constant in the equation is easily found, and is, in fact, given in the ability formula quoted in Mr. Buckendale's paper.

As far as the total gross load capacity of the tires is concerned, that also is easily found. Each standard size of tire has a regular load rating, and it is merely a matter of adding up the capacities of the individual tires, or—if all tires carried are of the same size—to multiply the capacity of the individual tire by the number of tires on the wheels.

Now, as regards capacities of the other supporting units, it has been stated that they should be considered dependent upon weight of the complete chassis. It would not be a good plan, however, to use a single multiplying factor or coefficient for trucks of all sizes, for it is well known that the ratio of useful load to chassis weight is ordinarily much smaller in the smaller sizes of trucks than in the large ones. The coefficient should be graduated in accordance with the weight of the chassis, and suitable values for the coefficients undoubtedly could be readily found from existing designs.

To illustrate the point, a truck chassis to carry a useful load of one ton usually weighs considerably more than one ton, whereas a chassis to carry a useful load of five tons weighs usually considerably less than five tons.

A Varying Coefficient for Chassis

The average weight of one-ton chassis listed in *Commercial Car Journal* specification tables is 3226 lb., which is equal to 1.61 lb. of chassis for each pound of net load, not counting body weight. In the case of five-ton chassis, the average weight is 9043 lb., which shows 0.9 lb. of chassis for each pound of net load carried. After the proper coefficients for chassis of different weights have been determined it is only necessary to multiply the chassis weight by the particular coefficient to obtain the gross weight rating.

We have now three gross-weight ratings for the same truck chassis, the first based upon the ability of its powerplant in conjunction with the reduction ratio and the wheel diameter to haul a certain gross weight up a 4 per cent grade in high gear; the second based upon the rated carrying capacity of its tires, and the third upon the total weight of the chassis, upon which the abilities of the frame, springs, axles and wheels to support load under truck-operating conditions are assumed to depend. These three ratings naturally will be different, and how is a single rating to be obtained from these three different ones in the most logical manner?

One line of argument in this connection would be that, since "a chain is no stronger than its weakest link," the lowest of the three ratings should be the one adopted for the truck. The writer believes, however, that it would be a better plan to use the mean of the three ratings. The comparison with the chain is not quite valid, for the reason that the breaking strength of the weakest link is the absolute limit to which the chain can be loaded, whereas any of the three ratings of the truck is really only a fraction of the maximum gross weight to which it might be loaded. If the lowest of the three ratings is exceeded in practice, that does not mean that the truck will fail, but merely that from the standpoint of the factor on which this rating is based it will not be quite so satisfactory.

If there are to be two ratings, a light-duty and a heavy-duty, then different coefficients will have to be used for the two for the rating based upon chassis weight. Suitable values for these coefficients can be found from present rating practice. How widely the two sets of coefficients may differ is indicated by data of 1½-ton trucks. The weights of 11 of the lighter truck chassis with a 1½-ton rating average 2775 lb., while the weights of 19 of the heavier chassis of the same rating average 4000 lb.

JUST AMONG OURSELVES

Reckless Driving and No Speed Limit

IN a recent issue of the *Austin Magazine*—always entrancing to us—there is some pertinent comment based on six months' observation of the new road traffic act in England, one of the provisions of which was removal of the speed limit.

"There has been no forward spurt by callous speed merchants, suddenly released from restraint," the publication states; "the outburst of recklessness, accompanied by a great increase in fatal accidents —which was the lurid picture drawn in advance by a small minority—has not occurred. . . .

"The experience of the working of the act has confirmed the fact that the speed limit for private cars had already been abolished by public opinion long before the passing of the act."

Thus is confirmed also the experience of American states which have removed the speed limit from their laws—that of those who haven't, for that matter.

Industrial Publicity Agent Can Help Editors

HAD a note this morning from our old friend Ed Schipper saying he liked the attitude we took a few weeks ago regarding governmental publicity and suggesting that maybe we might have something to say some day about industrial publicity, the work in which he is now engaged in partnership with George Sutton.

Some day we may get enough space to print the multitude of things which are on our chest about industrial publicity—but not today. It's too hot, and we just got back from a week's vacation. One little comment we will venture, however.

Poor Copy Easily Swept Aside

THE business paper editor, who doesn't know how to make use of such intelligent industrial publicity men as are scattered about his industry, is usually the one who howls loudest about what tripe most publicity is. It's perfectly true that a vast amount of publicity emanating from motor car companies is utterly useless to any business paper which really renders service to its readers, but after all, we contend, it's no overwhelming task to sweep that sort of stuff into a waste basket.

Where the publicity man really knows enough to be able to understand and obtain factual data about the policies, processes and products of his company, and when he is willing to spend enough time in personal contact with editors to listen to their wants, he can be a fine, constructive help to any editor. The major function of a good publicity man is not writing copy, but making it easy for editors to contact other executives when specialized data are wanted.

Reliability Must Prompt Trust

AND publicity men who work with their heads instead of their typewriters, who are useful contacts for intelligent business paper editors, are not as scarce as hens' teeth in this automotive industry at that—they are nearly that scarce, to be sure, but not quite. At any rate, we've found them at such companies as Autocar, Packard, Graham, General Motors Export and a number of others.

One thing the general executive often fails to realize when he intrusts public and press relations to a man in his organization: that is, that this man cannot possibly function effectively unless his big boss considers him sufficiently reliable to intrust him with detailed current knowledge of everything that's going on within the organization. Otherwise, this man will never be accepted as a contact by those seeking contact with the company. And this is natural, because if the public relations man doesn't know the facts anyone contacting with him isn't contacting the company; they're just contacting a man with a desk in the company's office.

No; we're not antagonistic to publicity departments and never expect to be. We do believe that, from the manufacturer's standpoint, many of them operate very wastefully—due usually more to the general policies laid down for their operation than to any deficiency on the part of the man operating them. But that wastefulness costs the editor nothing in money and very little in time, and sometimes he gets real help. So why should *he* rant about publicity?—N.G.S.

Machine Raised

By Joseph Geschelin

From the time that some immortal way back announced the doctrine of "caveat emptor" there has been an inherited state of antagonism between buyer and seller. And this condition is constantly intensified by a split in the ranks of the sellers due to fierce competition—forcing price cuts and other concessions. The buyer naturally wants to strike the best bargain. How often does he get it? That's open to a lot of argument. As a matter of fact, the cost of all service and all concessions has to be paid by somebody if the seller is to remain in business. Inevitably, therefore, some get something that looks like a bargain but many others foot the bill.

Is it too visionary to see the buying and selling of machine tools and incident service on a new basis which would make each machine carry its own share of the burden. Isn't it possible that ultimately this arrangement would spell tangible economies to the buyers of machine tools?

Now what would be an ideal setup within reasonable limits of acceptance? Here is a suggestion made by a prominent machine tool builder:

"In our opinion, the ideal arrangement would be to sell the machine either with or without special tools, ship them out to the customer and then follow up with a visit of a service man only in case of trouble for which we are responsible or against a definite requisition made for assistance at a specified rate per hour plus traveling and hotel expenses.

"In this manner the shop managed by a personnel capable of placing a new machine tool into the production line in efficient operation would not be called upon to pay any part of the charges made against a less fortunate plant not able to carry through on this basis."

To simplify our thinking along this line, let us classify the problem in this way:

1. The machine. (a) Standard machines having more or less universal application. (b) Special machines.

2. Standard guarantee covering workmanship and material.

3. Service charges.
   (a) Demonstrating.
   (b) Other service.

IS any service free? If so, since when? Commenting on free service in connection with machine tools, Norman G. Shidle said in part in an editorial* which has just received an A. B. P. award for editorial excellence, "Only those gloriously gullible folks, of whom Barnum said one is born every minute, seriously believe there is such a thing. Yet scores of buyers still demand it as a right and equal scores of sellers offer it as a part of their sales appeal.

"Unless an industry or an organization is on its way to bankruptcy, all of the 'free service' which it provides must be paid for by the buyers of its products in one way or another."

Judging from the comments which followed the publication of Mr. Shidle's editorial, many executives in the automotive field are thinking seriously about the problems involved in the buying of machine tools. In fact several large automotive manufacturers are contemplating an almost revolutionary change in buying habits, one of the proposals being a standardized contract form. Quotations on new equipment would be made on the following basis if the scheme is adopted:

1. Base price of the machine;
2. Separate price for tooling;
3. Service charge for setup and demonstration.

Now the relations between the buyers and sellers of machine tools and other capital equipment are not at all simple. Many complex factors enter in which are not so evident on the surface and are not usually discussed on the golf course. So we explored further with the help of a group of production executives and a number of leading figures in the machine tool industry. We propose to deal with such matters as service, tool charges, repairs and spare parts. By lifting the curtain on the other fellows' problems we hope to stimulate some constructive ideas for further discussion.

*Just Among Ourselves, A. I., Jan. 17, 1931.

Tool Price Levels Are by "Free Service" Costs

4. Tool engineering.
5. Replacement.

It appears desirable to treat standard and special machines separately. For example, the standard guarantee against defects in workmanship and materials applies equally to both, but the standard machine may be sold without any extra charges whereas the special machine will usually carry an added charge for setting up and demonstrating. An estimate on a new machine, therefore, might well include—

(a) Price of the machine;
(b) Price of tooling;
(c) Extra charge for demonstrating on special machines.

It's quite conceivable that some buyers will say, "Let's take off the extra charge for demonstrating because we know all about your machine." In reply to this a number of important machine tool builders are prepared to reply that the charge must stand and that a demonstration by a factory representative is absolutely necessary on certain equipment. Moreover, in many cases this charge is now included in the selling price of the machine. So the buyer really isn't getting this service *free*.

The attitude of many executives may be reflected in the following statement from an executive of one of the large motor car companies: "I discussed this matter with our general superintendent and he was of the opinion that the services of the demonstrator could not be dispensed with entirely and consequently could not become optional when a new machine of special design was purchased that included the tooling for the particular part for which the machine was designed. He stated that this type of equipment was usually purchased with a guarantee, therefore required the services of a demonstrator and that this service should be included in the price of the machine.

"The vast majority of machines sold, however, are more of a standardized type and will require very little demonstration. The subdividing of the charges for this kind of equipment could be arranged to better advantage than that of the special kind of machine."

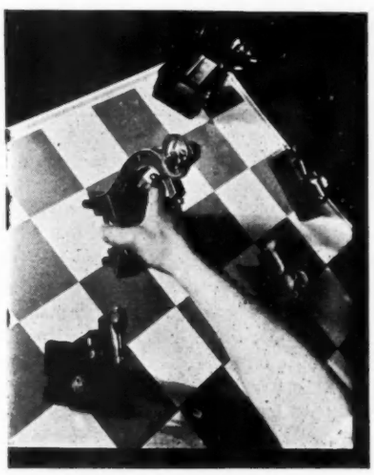
Now consider another matter—guarantees on production rate. Machine tools are being sold today on the basis of their productivity and this is the starting point for all considerations of selection. It is only reasonable to assume that the manufacturer will be prepared to carry out this guarantee and the cost involved in demonstrating it in production.

It seems fair to assume that the manufacturer should not be required to assume the burden of service outside of his guarantee or due to negligence or other contributing causes. A common example of this is found in the installation of lathe, boring mills and other machines with long beds. Proper leveling of such machines is an absolute essential if precision is to be maintained. And this is purely a problem of installation with emphasis on accurate leveling. Yet, we have been told of a number of cases where the manufacturer has been called upon to service machines improperly installed and foot the expenses of his service man.

Tooling brings up some nice problems of its own. The consensus of opinion is that tool charges should be listed separately on the estimate and segregated as to (a) Labor and material, and (b) Engineering expense.

But here are some complications! In many cases tooling is sold with a new machine or for retooling old equipment. However, there are other times when an estimate is submitted at the initiative of the machine tool builder in an effort to get new business. In the first instance the cost could be charged to the specific order, although some

This is the second of a series of articles on machine tool replacements. Here is shown the big part played on costs by such items as service, research, tooling. The August 8 issue will will discuss unit machines



guesses have it that the manufacturer actually gets only 20 to 30 per cent of the business on which he bids. On the other hand, in the case where a sales estimate is made, the costs are probably charged to sales expense. It's a delicate question to decide just what is a legitimate charge and what isn't.

Another thing is the practice of getting tool prices and designs and then buying tools from some local source unburdened with the necessary engineering expense. Unquestionably this imposes a serious strain on the manufacturers who employ large technical staffs in the interest of better service. Someone has to pay for this and all buyers are saddled with an overhead which should be borne by a certain few.

Local Tool Shop Cannot Meet Requirements

There is much to be said against this practice. Its weakness lies in the fact that the local small tool shop cannot possibly give equivalent service, nor can it build the tools as well as the maker of the machine. Although there may be some loud shouts of protest, isn't it a fact that in a great many cases tooling purchased in this fashion does not work properly? Isn't it also a fact that on numerous occasions the machine tool builder is asked to send a service man to tune up these tools and, in some cases, to repair the machines because of breakage due to inadequate or improper applications?

In practice this matter of tooling should be handled on some equitable basis between the buyer and seller. A number of people have suggested that the buyer should underwrite the tool engineering expense whether he buys the tools or not. Although this is favorable to the machine tool builder, isn't it also fair to everybody and good business?

When considering the business of buying and maintaining machine tools, one must not overlook the matter of replacement parts. This is as much a problem in the equipment industry as it is in servicing automobiles. And certainly the same reasons for and against buying from the manufacturer apply.

Since machine tools are of a special nature and are not interchangeable as to parts to the same degree as automobiles, replacement parts usually are not stocked locally. This, plus the necessity of getting the machine back into service quickly, has forced users to turn to others for assistance.

Something for User and Maker to Think About

Accordingly, replacement parts usually are made up locally in the small tool shops, and this is probably justified in many cases. But is it always possible for this tool maker to build a part from scratch so well that it will fit into a complicated mechanism and function properly? A number of actual cases have proved that it isn't. Yet the manufacturer of the machine has been forced to render free service because the user has blamed the machine for the breakdown. Surely something for both user and manufacturer to think about.

Why should the buyer concern himself with all these matters? The best answer is that it's sound business. If machine tools are bought on a recognized and definite basis, costs can be allocated properly and the burden carried by the machine and the buyer requiring special services. Then special equipment will carry definite fixed charges while the standard machines may properly carry a lighter burden.

Of course this is something in the offing and depends entirely upon the degree of cooperation between everyone involved. It is quite conceivable, for example, that standard machines might be priced lower. On the other hand, they may be forced to carry some burden—even though a small one—indefinitely. Another reason why the buyer should become interested is the possibility that certain strong manufacturers, particularly those building what may be called a noncompetitive type of machine tools, may raise prices arbitrarily for their own protection.

Here is what one such manufacturer says: "We are of the firm opinion that the customer should pay for service. However, we have never yet found any customer willing to assume the responsibility. Accordingly, we have a fixed charge which we insert in our quotation which is a part of the price of the equipment and determined from an average, covering machines built by us for approximately three years. This fixed charge is added arbitrarily to our quotation.

"In some instances our fixed charge is more than necessary to cover the cost and in others we run over somewhat. At any rate, it is the only way we have been able to find so far to give us protection against servicing. We also have another fixed charge in our quotation for demonstrating machine."

Here are some tangible benefits to users of machine tools. First of all, an equitable cooperative effort will promote fair pricing. This will not only benefit the buyer but will produce the desired degree of stability to the seller which will be a guarantee of continued usefulness and adequate service to the buyer.

Those Who Need Service Should Pay For It

Another effect will be to relieve the load on standard machines and promote a better distribution of costs. Those who need a lot of service should pay for it. Those who do not, should carry less of the load. Many production men are thinking along these lines. One of them says, "It is my firm conviction that the price of a machine should cover the cost of building it according to the specifications required by the customer's purchase order and, that any service required beyond that should be paid for by the purchaser. The manufacturer of the machine, of course, would be required to assume responsibility for any defect either in material or workmanship which develops after the machine was put into operation."

Perhaps there is no exact answer to all these questions. Yet an answer is of fundamental importance and a reasonable approach certainly is desirable. When some of the larger buyers mentioned earlier take the initiative, many others unquestionably will fall in line.

IT is reported from France that the Michelin tire firm recently fitted some railcars with pneumatic tires and made a demonstration to engineers from various railway companies at Issoudon. It is claimed that these tires assure silent and smooth running of the cars and that the absence of jolting and shocks will lengthen the life of the rails. How the problem of side thrust is taken care of is not stated in the report to hand.

A WRITER in *Automobiltechnische Zeitschrift* investigates the effect of firing order on torsional vibration in eight-cylinder in-line engines and comes to the conclusion that this effect is negligible whether the usual 2-4-2 type of crank or a 4-4 type is used.

Development of Light Piston Alloys Has Increased Wearing Qualities

ALTHOUGH a considerable number of bimetallic or composite pistons have been developed both here and in Europe, practically none are in regular use at the present time. During the early years of pistons of light alloys there seemed to be a need for such bimetallic pistons, as the plain light metal piston called for excessive clearance in the cylinder, and in addition it wore rather rapidly on the skirt. In an article devoted to bimetallic pistons, in a recent issue of *Automobiltechnische Zeitschrift*, Dipl.-Ing. E. Mahle gives as the reason for the practical disappearance of these bimetallic pistons that the problems they were intended to solve have been solved more effectively in other ways. The need for excessive clearance has been overcome by the use of split-skirt pistons, invar-strut pistons, and low-expansion aluminum alloy pistons, while the rate of wear on the bearing surface has been greatly reduced by the development of light metal alloys of much greater Brinell hardness.

The hardness figures of various modern piston materials are plotted in the accompanying graph against temperatures. Not only the heat-treated copper-aluminum alloys, such as Bohnalite and Y-alloy, but also the high silicon alloys of aluminum, such as Alusil, KS 245 and KS 280, are very resistant to wear under sliding friction and give absolutely no cause for complaint on this score. With such pistons, when they are removed from the engines after very considerable mileages, the grinding-wheel marks are still visible on the skirt, which to the specialist is the best indication that the wear does not exceed 0.0005 to 0.001 in.

Today the problems confronting the specialist in light alloy pistons revolve around improvements of the ring belt against stresses due to the explosion pressure and high temperatures of the burning gases and to the hammer-like blows which the piston rings deal the piston lands.

This last problem of light alloy pistons, which has not been fully solved as yet, is best illustrated by Figs. 2 and 3 showing pistons produced in 1921 and 1930 respectively. In each case the ring belt was destroyed by gradual wear of the outer surface of the rings and of the lands on their sides, and finally breakage of the rings and destruction of the entire ring belt occurred. Pictures like these are seen very rarely in connection with cast iron pistons, whereas in connection with light alloy pistons, especially where the requirements are more severe, as in motorcycle, Diesel, truck and bus engine, they are not particularly rare. Although in most cases the damage done is not as severe as indicated in Figs. 2 and 3,

(Turn to page 177, please)

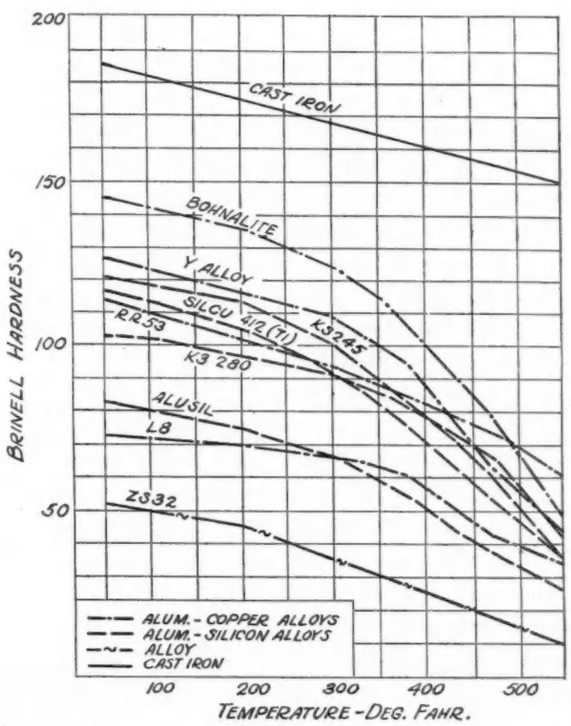


Fig. 1—Variation of the Brinell hardness of various piston materials with temperature

Fig. 2—A 3-in. light alloy piston cast in 1921 of which the ring belt has been destroyed

Fig. 3—A 4¾-in. light alloy piston of 1930 production of which the ring groove lands have been broken off in places + + +

Chrysler Riding-Quality Accelerometer

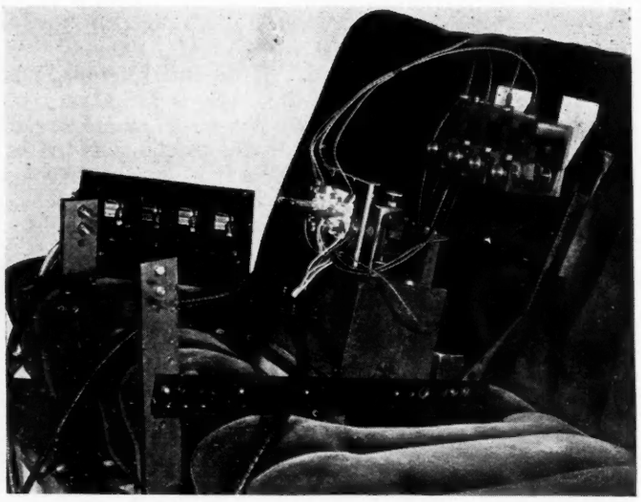


Fig. 1—Side view of Chrysler riding-quality accelerometer, showing the seat-cushion and back elements

The number of vibrations of each of four acceleration values are counted automatically + + + + + +

AN apparatus for testing the effect of seat cushions on riding qualities while driving has been developed by the Engineering Department of the Chrysler Corporation. The device, which may be quickly installed in any passenger car or bus, comprises two accelerometers of the contact-type, each consisting of four elements, which are used to measure seat and back-cushion forces in an articulating fashion.

One of the accelerometers, adjusted to register vertical accelerations of four different magnitudes, is bolted down to a weight of approximately 80 lb., mounted on a wood platform which has an area equivalent to that taken up by the average passenger on the seat. The platform rests on the seat (front or rear) and is pivotally attached by two extension arms to a bracket screwed or bolted to the floor of the car in front of the seat, so as to permit it to swing in a vertical arc in proportion to the movement of the seat cushion. It is obvious that the weight and accelerometer will then simulate to a large extent a passenger of medium weight sitting on the seat.

However, this accelerometer registers upward or vertical forces only, so in order to complete the data required in testing cushions or chassis riding qualities, the other accelerometer, which is adjusted to register accelerations at right angles to those registered by the first or horizontally, is made part of a second platform consisting of solid steel, which is pivotally connected by downward extension arms to the rear of the other platform and rests at a reclining angle against the back cushion of the seat.

The area of the upright platform somewhat approximates the era of a passenger's back against the cushion, and the weight of the platform plus the accelero-

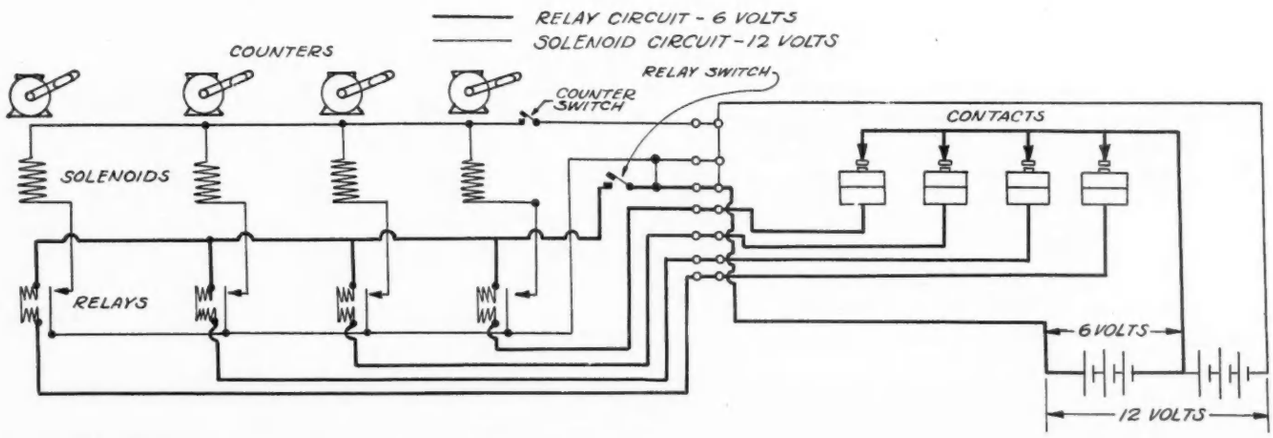


Fig. 3—Wiring diagram of riding-quality accelerometer

Registers Vibrations in Seat Cushions

by Clark A. Tea
Experimental Engineer, Chrysler Corp.

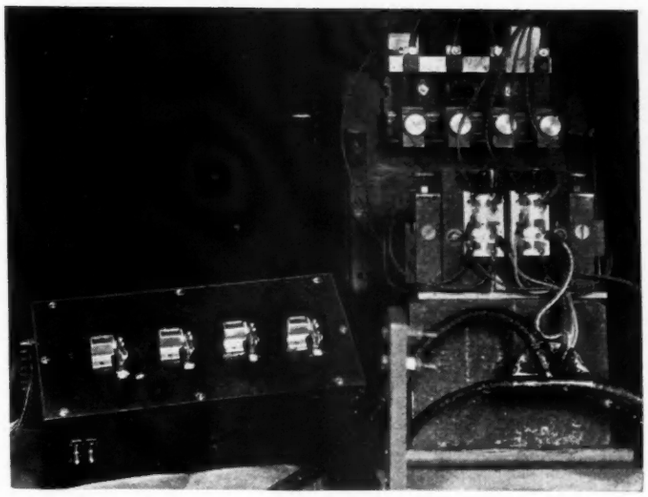


Fig. 2—Frontal view of riding-quality accelerometer

meter weight applies a force of about 30 lb., simulating the back reaction to the passenger. This accelerometer, which is a duplicate of the lower one, is mounted at 90 deg. to it on the back platform, with an adjustment for leveling it before making a test.

Practically the total weight of the complete apparatus is carried by the seat, so that in effect a mechanical passenger of 150 lb. is stably seated.

It is readily seen from the foregoing that accelerations produced by the vertical and angular displacements of the car body in one plane are both registered in eight different degrees and graduations.

While the parts of this apparatus may seem unwieldy, they can be handled by two persons with comparative ease and may be put in or taken out of a car within a remarkably short time. Sufficient adjustments permit perfect seating of the forms in the seat, as the photo shows.

As has been said, these accelerometers are classed as of the contact-type but before those familiar with this problem are roused to undue criticism, let it be said that in passenger-car work, according to our experience, the type of instrument we have developed is capable of registering with negligible error all accelerations received through the cushions of a car; furthermore, all parasitic vibrations which ordinarily are so detrimental to accuracy in the contact type, are completely shielded by the upholstery of the modern car. In other words, for the purpose of testing seats—which, after all, represent the final answer in the riding of a vehicle and include all the factors in one suspension—there are not the usual difficulties to be met that have to be taken into account when testing the chassis or axles.

Each element consists of a 0.26 lb. weight suspended

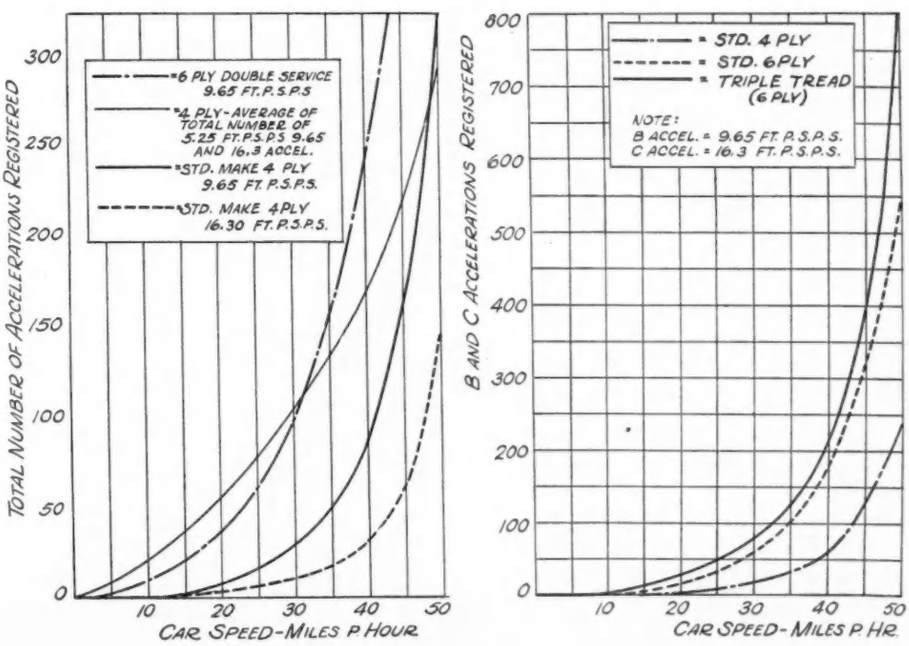


Fig. 4 — Variation of total number of accelerations with speed for different types of tires (Road, new concrete; distance, 2 miles) + +

ACCELEROMETER TEST

Date: *Jan. 28, 1931* Car: *Light 8*

Cushion: *Standard* Springs { Front: *Standard*

Speed: *35 m.p.h.* Rear: *Standard*

Run: *1 mile*

Location: *Nine-Mile Rd., West*

Tire Pressure: *40 lb. and 35 lb.*

Accelerometer Setting: *Ft./sec.²*

Seat:	A— 5.2	Back:	A— 7.6
	B— 9.6		B—10.3
	C—16.3		C—13.2
	D—20.0		D—16.0

	Seat				Back			
Acceleration	A	B	C	D	A	B	C	D
Front.....	Not tested							
Rear	174	90	24	12	102	56	31	22

Remarks: *Standard shock absorbers. Too many D's in back test for comfort.*

Fig. 5—Summary of Preliminary Acceleration Tests on rear-seat cushions + + +

from the end of a flat cantilever spring, with a very finely threaded set screw for adjustment. It is adjusted against the weight at its center of gravity to produce additional deflection in the spring equivalent to the designated acceleration, which is determined by the dead weight method. Regulation distributor points are used in the contacts, and so far no trouble has been experienced from contacts damaged by arcing, which latter cannot be altogether eliminated.

The numbers of accelerations are counted automatically on electrically operated counters that are capable of counting up to 15-20 per second without missing. This conservative figure has been determined experimentally by increasing the speed of a cam operating the element till the counter would begin to miss. The counters are operated by individual relays and solenoids, the solenoids drawing down an aluminum core which actuates the arm of the counter at each break of the accelerometer contact, and a quick spring returning same. The natural period of our accelerometer is in the neighborhood of 900 vibrations per minute.

The wiring diagram of our riding-qualities' instrument is shown in Fig. 3. It requires two 6-volt batteries to operate the device, 12 volts for the counters and 6 for the relays.

As regards the reliability of this instrument, it is merely necessary to say that 50 or more tests have been made at one time without the elements getting out of calibration more than ½ ft. per sec. per sec., and it is rare that a retest, made over the same 2-mile stretch of road at the same speed, does not check another within 10 per cent. This variation we consider allowable.

Our acceleration values vary in the following order, which always can be changed:

Seat	A— 5.2 ft. p.s.p.s.	Back	A— 7.6 ft. p.s.p.s.
	B— 9.6 ft. p.s.p.s.		—10.3 ft. p.s.p.s.
	C—16.3 ft. p.s.p.s.		—13.2 ft. p.s.p.s.
	D—20.0 ft. p.s.p.s.		—16.0 ft. p.s.p.s.

As regards calibration of the back-cushion accelerometer, it is of interest to note that we are forced to use a specially designed sensitive spring scale pointer, since it is impossible to use the dead-weight method directly in a horizontal plane.

Hundreds of road tests have been made with these instruments, particularly for testing cushions, and it has been possible to redesign and rebuild seats and backs to accomplish materially improved riding comfort. In one instance we conducted tests on tires for a well-known rubber company, by using one of the units on the floor of a car, with a pad interposed to absorb parasitic vibrations. Chassis springs and shock absorbers were maintained constant while complete tire changes were made and tests run over the same route at the same speeds. The results showed four-ply tires on this particular car to give only one-half as many accelerations as the six-ply, on the average, at 20 m.p.h. Curves 1 and 2 show how acceleration varies with speed.

Fig. 5 shows some sample test results obtained on our record form, and Fig. 6 gives a summary of data.

SUMMARY OF PRELIMINARY ACCELEROMETER TESTS ON REAR SEAT CUSHIONS

Car: Light 8

Raod: Nine-Mile, west of Van Dyke (considered rough)

Speed: 35 m.p.h.

Course: 1 mile

Accelerometer: Contact type (Chrysler design)

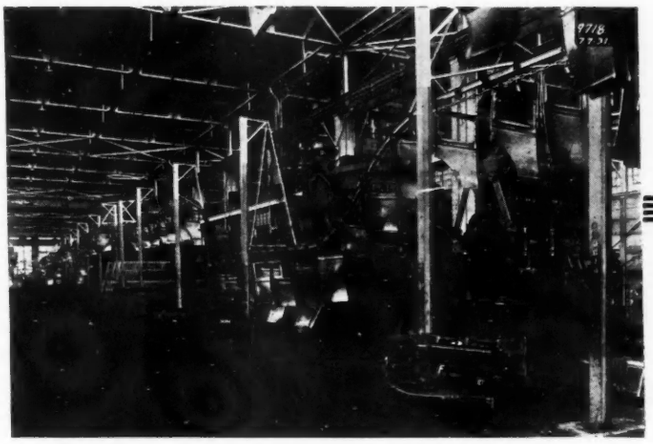
Average of at Least Three Tests
Number of Accelerations Registered

	5.2 ft. p.s.p.s.	9.6 ft. p.s.p.s.	16.3 ft. p.s.p.s.	20.0 ft. p.s.p.s.
Standard	174	90	24	12
Air cushion	150	54	12	12
Special sponge rubber	168	12	6	4
Standard cushion of higher priced car	132	30	0	0

Note: Any acceleration over approximately 10 ft./sec./sec. is felt by the rider very definitely. Thus a large number of the 16.3 ft./sec./sec. accelerations per mile is not considered good, especially on a long drive.

CHRYSLER CORP.,
Engineering Research Department.

Fig. 6—Tests made on seat materials are here compared



PRODUCTION LINES

Production Lines of the Industry No. 2

Making doors is one of the big activities at the E. G. Budd Mfg. Co. Philadelphia plant. This view shows a small section of the door conveyor. Its total length is 3256 ft. and carrying capacity 55,600 pieces in 10 hr. The daily capacity of the door plant is 12,000 doors + + +

Bath Drill Selection Table

Production men, engineers, and draftsmen will be interested in the tap drill selection table which has been published in a convenient card form by John Bath & Co., Worcester, Mass. A special feature of this table is a section relating to a method of calculating drill sizes for special taps. This particular information was abstracted from this company's "Thread Specifications," second edition, copies of which are available on request.

Believe It Or Not

But a lot can be done to cut costs and improve methods in polishing, according to a specialist who has spent many years in this field. What about standards for wheels, polishing speeds, compounds, etc.? Have these been formally defined? If he is right there is much room for simplification. Also hope for better costs. How does it strike you?

Old Turnings

Some of the old lathes were equipped with belts of catgut. There is an apocryphal tale of the apprentice boy who also played the violin. One day the shop master found him holding the bridge strings of the violin against a whirl ing belt and producing weird tunes by shifting the instrument back and forth. So was born the automatic violin, which tortures patrons in the cheaper grade of restaurant. Believe it or not.

Presto! Change

Interchangeability of pivots and bearings in Toledo scales was strikingly demonstrated recently. C. C. Neal of the Toledo Scale Co. removed old ones and put in new ones in 10 minutes. In each case the indicator split the line. We are told that formerly pivots had to be honed and checked repeatedly with gages.

About Glue

Excesssive humidity in polishing and wheel departments is the cause of many troubles with glue. Moisture in the air prevents glue from setting and holding properly. Dehumidifying is the only solution. So says Bradford H. Divine, in his interesting treatise, "The use and treatment of glue for polishing."

Good News!

Carboloy "77" is officially introduced by P. R. Mallory, in the May-July, 1931, issue of "Carboloy." It is a cemented tantalum carbide developed for certain steel-cutting applications. Quoting Mr. Mallory, "We are proceeding slowly in its (carboloy "77") exploitation because we recognize that we still have a great deal to learn. We are confident, however, that we have produced a material which is unmatched in quality for the fields in which it has special utility."

Cool With Paint

Cool color schemes for factory interiors advocated by M. Luckiesh, director, G.E. lighting research laboratories, in *Mechanical Engineering*, July, 1931. "In the work world it is generally not difficult to keep warm. Perspiration is commonly associated with work. To feel cool is far more desirable in work places than to keep warm." So Mr. Luckiesh recommends the following color scheme as a starter.

"Gray green for dado and lower portions of columns and possibly for machinery.

"Medium tint of pea green for upper walls and other large areas.

"Near-white for ceiling—either a mere suggestion of yellowish green or even a cream.

"Medium tint of pea green for structural beams to give the feeling of support.

"If there are many beams, aluminum paint may be satisfactory."

Welding Manganese

"Manganwald" is a new electrode for welding manganese by the shielded arc process. Made in standard 14-in. lengths by The Lincoln Electric Co., Cleveland. Electrodes are 11 to 15 per cent manganese, with a heavy extruded coating for protection. Welds are air toughening, which eliminates quenching. Recommend laying metal in pads ½ in. to 1 in. wide, not more than 3 in. long.

Worth Knowing

Control of small tools in a well-known plant in Detroit is entirely in hands of the master mechanic. Their selection is based on recommendation of standards department. The purchasing agent buys to specification only. But new products may be substituted if they pass the standards department. Many expensive tools, gages, drills, etc., are found here. Because they produce real economies in the long run, low first cost is seldom compatible with over-all economy in production.—J.G.

MANUFACTURING MANAGEMENT METALLURGY

Properties of Cast Iron Are Improved

Strength, endurance limit, hardness, machinability and wear are said to be increased by use of this alloying element + + + + + + + +

IT is now practically a decade since alloyed cast irons were first introduced as superior materials for automobile engine cylinders, cylinder heads and pistons, and their use in cylinder castings, at least, has assumed considerable proportions. The principal claims made for alloyed as compared with ordinary cast irons are that they show higher tensile strengths and that their Brinell hardness (to which the resistance to wear is presumably proportional) is considerably greater, while the machining qualities are not impaired, and in some cases they are even improved.

Molybdenum, which has been used as an alloying element for steels for automobile production for a considerable time, has been put forward more recently as equally well adapted for addition to cast iron. The effect of the addition of a certain proportion of molybdenum on the properties of the cast iron depends to a considerable extent upon the original composition of the iron. Representative test results giving the physical properties of different kinds of cast iron with and without certain definite molybdenum contents are given in the table herewith. The general effects of molybdenum additions in improving the physical properties of the whole range of cast irons are summarized as follows in a recent publication of the Climax Molybdenum Co. of New York:

Molybdenum—
- increases the tensile strength 20-40 per cent;
- increases the transverse strength 25-40 per cent;
- increases the endurance limit approximately 25 per cent;
- increases the impact strength 50-100 per cent;
- increases the Brinell hardness 10-50 points;
- improves the machinability for the same hardness;
- increases resistance to abrasion or wear.

It is claimed that the beneficial effects of molybdenum are not fully reflected by the mechanical properties, as they reside to quite an extent in improvement of the structure of the iron. Molybdenum irons are said to be more resistant to softening or graphitization under heat than are plain cast irons, owing to the greater stability of the complex molybdenum carbides. Since only a part of the molybdenum content is in the form of carbides, this effect can be augmented by the addition of other alloying elements, as will be discussed later.

Molydenum cast irons are said to be more resistant to ordinary atmospheric corrosion than ordinary cast iron, and also more resistant to the action of certain chemicals, particularly sulphite liquors. Growth and distortion in service is said to be less in the case of parts made from molybdenum iron than in the case of parts made of other irons, the reason for this difference being believed to be the peculiar nature of the graphite inclusions. Owing to the reduced growth and the greater tensile strength, molybdenum iron often eliminates service failures in parts that gave trouble when made from other irons. Molybdenum irons also have been found to be less subject to growth and volume changes when subjected to high temper-

Expansion of Alloy Cast Irons

Chemical Analysis

Sample	Carbon, Per Cent	Manganese, Per Cent	Phosphorus, Per Cent	Sulphur, Per Cent	Silicon, Per Cent	Molybdenum, Per Cent	Nickel, Per Cent
No. 1 (Steel)	0.20	...	....	....	....	...	...
No. 2	3.25	0.59	0.093	0.091	2.22	...	...
No. 3	3.32	0.44	0.127	0.065	1.93	0.37	...
No. 4	3.26	0.43	0.116	0.064	1.89	0.73	...
No. 5	3.14	0.40	0.126	0.080	1.99	...	1.41

Above is shown the composition of specimens listed in Fig. 1

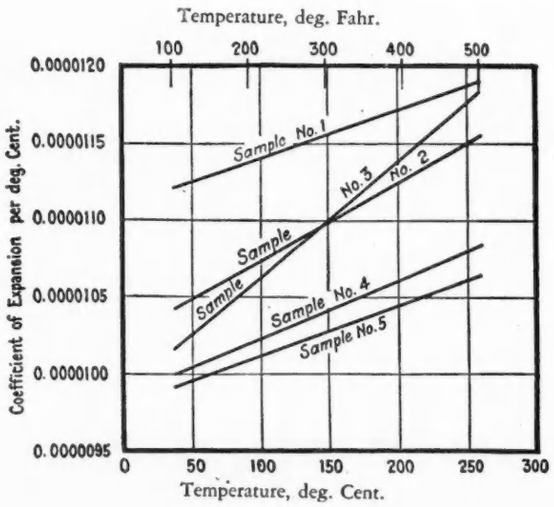


Fig. 1 (left)—This graph shows how the heat-expansion coefficients of different grades of alloy iron vary with the temperature. The compositions of the irons are given in Table I

by Alloying It With Molybdenum

Comparison of physical properties of different grades of cast iron with and without molybdenum

	CYLINDER IRON		PISTON IRON		DIE IRON	
	Without Molybdenum	With Molybdenum .35%	Without Molybdenum	With Molybdenum .80%	Without Molybdenum	With Molybdenum 1%
Tensile strength	29,000	38,000	28,000	41,000	40,000	56,000
Transverse strength	3,500	4,400	3,300	4,700	4,800	6,400
Brinell hardness	198	208	201	213	235	285
Machinability rating according to type of iron	Good	Very Good	Good	Very Good	Good	Good

Fig. 2—Photomicrograph of ordinary cylinder iron, unetched, at 100 magnifications, showing the graphite distribution + +

atures, which is thought to be due to the smaller size and better distribution of graphite particles. Graphs are submitted which show a much lower volume change for molybdenum iron when passing through the critical range on the first heating, and no volume change at all on further heatings. These properties naturally make molybdenum irons promising for high-temperature work, although, of course, they are not heat-resistant in the sense of being non-scaling under oxidizing conditions at high temperatures. The addition of chromium will probably be of further advantage in such work.

Fig. 1, which is taken from a paper on Present-Day Methods and Utilization of Automotive Cast Iron, presented at the 1930 Detroit Regional Meeting of the American Society for Testing Materials by A. L. Boegehold, shows the effect of molybdenum on the coefficient of expansion of cast iron. Samples Nos. 3 and 4 in the figure represent molybdenum irons, as will be seen from the table of specifications of the samples. The coefficient of expansion is low for both samples at ordinary temperatures, and in the case of sample No. 4, with 0.73 per cent molybdenum, the increase in the coefficient with increase in temperature is also low. This, of course, tends to support the claims made as to low distortion.

A direct result of the comparatively low value of the coefficient of expansion is a reduction in the tendency to crack in the mold while cooling, and it is pointed out that the consequent reduction in losses should be taken into account in figuring the cost of the molybdenum additions.

The various improvements in the quality of cast iron through the addition of molybdenum which have been outlined in the foregoing are due to three primary effects, as follows:

1. A modification of the size, shape and distribution of the graphite particles, which are smaller, more rounded or curved, and more nearly uniformly distributed throughout the structure than in ordinary iron. Large interfering flakes of graphite are completely absent.

Fig. 3—Another photomicrograph of ordinary cylinder iron, unetched, at 100 magnifications, showing graphite distribution

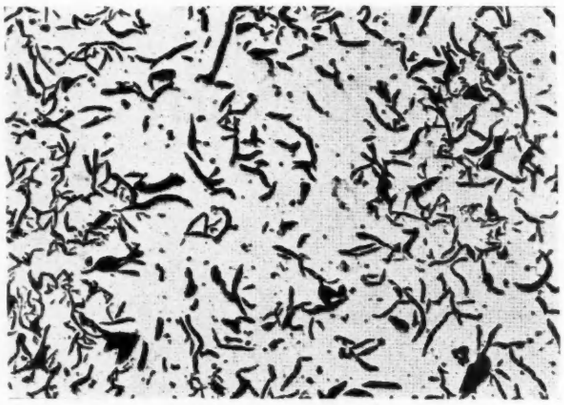


Fig. 4—Photomicrograph of molybdenum cylinder iron, unetched, at 100 magnifications, showing graphite distribution + +

This modification and dispersion of the graphite is well shown in Figs. 2, 3, and 4, which were taken at magnifications of 100 diameters. The samples were not etched, so the contrast is merely between the graphite inclusions and the metallic matrix, the carbide component of the matrix not being distinguishable until the specimen is etched. Specimen No. 2 was cut from automobile cylinders, made of ordinary cast iron, while Nos. 3 and 4 were from cylinder castings of molybdenum iron containing 0.35-0.40 per cent of molybdenum.

2. A strengthening of the ferrite or carbonless portion of the iron structure, due to solution of molybdenum in the ferrite.

3. A further strengthening of the metallic matrix, since the complex carbides which are also formed are stronger and better disseminated in it than are normal carbides. The complex molybdenum-iron-manganese carbides result in a finely divided feathery pearlite tending to be sorbitic, more stable, more nearly uniformly distributed, and covering a larger portion of the whole area than do the carbides in an unalloyed iron.

When the specimens are etched with very dilute acid the ferrite can be differentiated from the carbides spread through it and which abut more or less on the particles of graphite contained in the iron. The specimen of molybdenum iron previously shown unetched in Fig. 4 is shown etched in Fig. 5, the magnification being the same. This clearly shows the very fine structure of the pearlite.

Molybdenum is said to differ from some other alloying elements for cast iron in that its full effects are not realized unless the base composition is within certain definite limits. In general it is necessary to hold the carbon content between 3.00 and 3.25 per cent and the silicon content to well below 2.25 per cent. This applies to what may be called automotive irons, which must machine well in production and which show a Brinell hardness of about 200 in 1-in. sections. For other types of work in which sections are heavier, a lower silicon content may be required, and with lower silicon there may be a moderate increase in total carbon, but 3.35 per cent of carbon should not be exceeded for good results.

For piston rings and similar light sections a higher silicon content may be used, but the hardness of the material will then be similar to that of the base composition given. Distinctly soft castings of any considerable size, containing 2.50 per cent of silicon or more, with over 3.30 per cent of total carbon, are not greatly improved by molybdenum. Moreover, a minimum of 0.35 per cent of molybdenum must be used in cast iron to achieve any marked improvement in its properties.

For various purposes different additions of molybdenum are recommended. The addition of 0.35-0.50 per cent of molybdenum will give substantial increases in physical qualities, refinement in grain size, and some additional resistance to wear. Unless the silicon or total carbon of the iron already used is too high, it will probably not be necessary to change the base composition. The Brinell hardness will be increased, but the machinability will be improved rather than impaired.

An addition of 0.50-0.75 per cent of molybdenum will give greatly increased physical properties, increase the hardness about 20 points Brinell, and give marked resistance to wear. Irons of this class will show good resistance to growth and distortion under high temperatures. The iron, although it will have a Brinell hardness of 220 in cylinder-head sections, will be machinable under production conditions, although, of course, not as machinable as softer irons.

For light-section castings with molybdenum, such as cylinders, cylinder heads and pistons, the silicon should be around 2.20 per cent for machinability. For heavier sections, such as pressure-plates of clutches, the silicon should not exceed 2.00 per cent, and the total carbon should not exceed 3.25 per cent.

An addition of 1.00-1.50 per cent of molybdenum will give a high-grade, heavy-duty iron. Its normal physical properties will be greatly increased, with the transverse strength approximating 7000 lb. per sq. in., the Brinell hardness will be 265-280 in heavy castings, such as dies of 3-in.-4-in. section, and the resistance to wear will be very pronounced. For such castings the silicon content should be from 1.50-1.70 per cent, and the total carbon content from 2.80 to 3.20 per cent. Cast iron with 1.25 per cent molybdenum gives an entirely pearlitic matrix.

For use in cylinder blocks, cylinder heads, pistons and other parts of gasoline engines, best results are secured with 1.90-2.10 per cent of silicon, 3.00-3.20

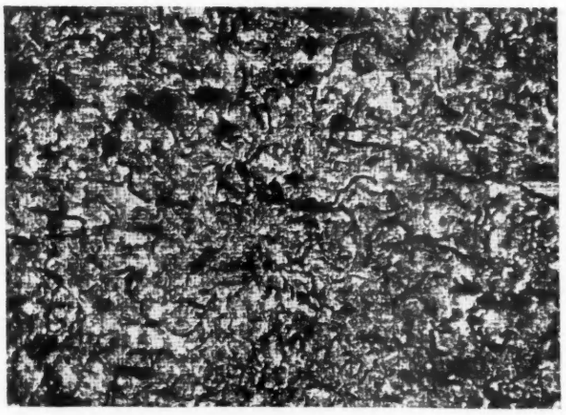


Fig. 5—Photomicrograph of same iron as that represented by Fig. 4, etched, at 100 magnifications, showing general structure and distribution of pearlite + + +

per cent total carbon, and from 0.35 per cent molybdenum upward, depending on the hardness, wear and strength required. The usual addition to this type of iron is 0.35 per cent of molybdenum, and such irons are said to be giving very satisfactory results in practice.

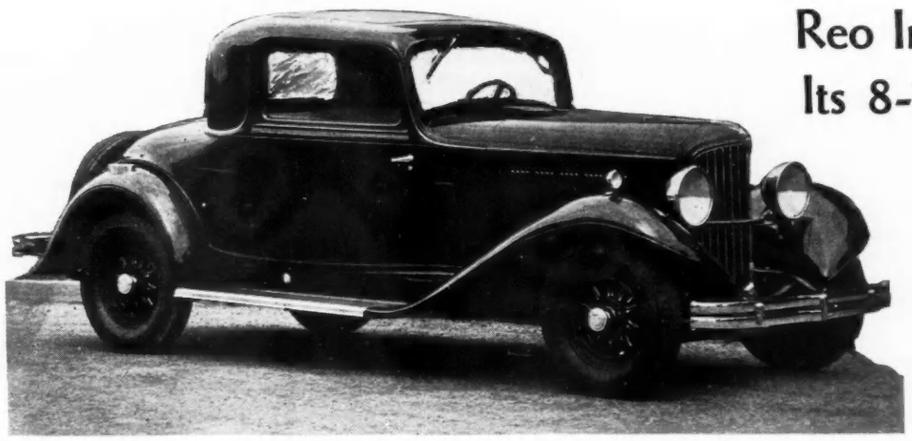
A table of chemical compositions and physical properties of eleven different molybdenum cast irons, produced by four different foundries, shows that with 0.35 per cent molybdenum the tensile strength varies from 34,800 to 38,900 lb. per sq. in., while the transverse strength varies from 4060 to 5100 lb. per sq. in.

The name wear-resistant irons has been given to a class of automotive irons containing from 0.50 to 1.00 per cent of molybdenum, which are used for cylinders of air-cooled aircraft engines, brake drums, clutch plates, machinery parts and dies for working light-gage metal.

For such parts as valve seats, for instance, where a further resistance to breaking down under heat of the combined carbon is desirable, an addition of chromium may be desirable, the complex chromium carbides requiring higher temperatures and longer times to break them down. In cases where it is desired to increase the proportion of Brinell hardness to strength, an addition of chromium may also be logical, the molybdenum then being added for additional strength and for structural refinement, and the chromium for higher Brinell hardness. These additions, however, should be made with caution, since the combined effects of the two alloying elements may be more drastic than anticipated, and the chromium also may produce hard spots in the castings.

For any of the classes of iron mentioned in the foregoing, a chromium addition of 0.25-0.30 per cent is suggested. In a few cases nickel has been used for its effect in deferring chilling in thin sections and corners.

Reo Introduces Its 8-25 Line



New Flying Cloud 8-25 Coupe

INTRODUCTION by the Reo Motor Car Co. of its latest model, the 8-25, priced at $1,745 for the coupe, victoria and sedan, gives this company a line of four eights covering the price range from $1,395 to $2,995. In addition there is, of course, the 6-21 at $1,295, with a six-cylinder powerplant.

The new eight, which has a wheelbase of 125 in., as indicated by the model designation, is priced slightly higher than the six-cylinder model 25N introduced last fall. While the chassis specifications are similar to those of the 25N, bodies are more along the line of the Royale types. In addition to the "aerodynamic" bodies, the new eight also has a V-shaped radiator and new fenders of the same general type as those on the other Flying Cloud models, as may be noted from the illustration.

The engine appears to be similar to that in use on the 8-21, or Flying Cloud Eight, with a bore and stroke of 3 x 4¾ in. and developing, it is claimed, a maximum of 90 hp. at 3300 r.p.m. Pistons are of the invar strut aluminum alloy type. Rubber engine mountings are used at the rear, solid mountings at the front.

Coiled springs are used to cushion the 10-in. clutch plate. Herringbone gears are used in the transmission, as on other Reo cars. A gear ratio of 4.42 to 1 is used in the spiral bevel semi-floating rear axle. Brakes are 14 in. in diameter and hydraulically operated of course. Tires of 6.50-in. section are used on the 17-in. wheels.

CRACKING of hydrocarbons, as now widely practiced in the production of gasoline, is a sequence of decomposition and polymerization reactions, according to Per K. Frolich writing in the June issue of *Chemical and Metallurgical Industry*. The character of the final products is determined by the nature of the hydrocarbons present in the original cracking stock, by the pressure and temperature of operation, and by the time of exposure to cracking conditions. Polymerization under otherwise similar conditions is proportional to the square of the pressure; it also increases with the temperature, but apparently less rapidly than the rate of simple mechanical breakdown. If the temperature is high and the pressure low, polymerization is accompanied by the liberation of hydrogen. By increasing the pressure the liberation of hydrogen is counteracted.

Air Flow in Diesel Engine Helps

In designing an engine in which high air velocities are to be employed within the combustion chamber, care must be taken to keep the pumping losses as low as possible by using smooth air passage

THE effect of high air velocities on the distribution and penetration of a fuel spray has been studied at Langley Memorial Laboratory by means of the N.A.C.A. spray photography equipment, and the results are given in Technical Note No. 376 of the N.A.C.A., the author being A. M. Rothrock. The effects of low air velocities (up to 60 ft. p.s.) has been studied previously, but it was found that in combustion chambers of the shape employed in the N.A.C.A. in its research on pre-combustion chambers, and in chambers of the type employed with the Acro-Bosch system, air velocities of several hundred feet per second may be obtained. Under these conditions the air velocities are equal to or greater than the velocity of the fuel spray after it has traversed an inch or so of the combustion chamber. In the recent tests the air velocities were carried as high as 800 ft. p.s. In all of the tests the fuel was sprayed into air at atmospheric pressure and temperature, but from investigations made at the same laboratory on the effect of air density and air temperature on spray formation it is concluded that any effects observed in these tests will be magnified under engine operating conditions.

The fuel was sprayed into a cylinder provided with a cylinder head of the form shown in Fig. 1. A small rectangular orifice connected the head or spray chamber with the cylinder. There were no valves in the head, and both faces were open to the atmosphere. Consequently, the air displaced by the piston of the engine was forced through the narrow opening into the surrounding air, which was at atmospheric pressure. The fuel injection system was operated through a clutch, so that a single injection was obtained when the clutch was engaged. By means of a gearing unit the injection could be timed to start at any crank angle. The start of injection with relation to the crank angle was determined by mounting the injection valve directly over the flywheel of the engine and spraying onto a piece of heavy paper attached to the flywheel. With a given timing the start of injection for successive tests did not vary by more than 0.5 crank degrees. The period of injection as measured from the spray photographs was approximately 0.003 second. The engine speed was constant at 800 r.p.m.

Equations are developed in the Note by which the pressure within the cylinder and the velocity of air flow through the opening at any crank angle could be calculated. The injection valve used in the tests is shown in section in Fig. 2. It had an orifice of 0.020 in. diameter, and an injection pressure of 3500 lb. p. sq. in. was used in all tests.

From theoretical considerations it was concluded that for air at low densities, velocities of 300 ft. p.s. or more are required to deflect a single drop a distance of 1 in. in 0.001 second, or approximately 10 crank degrees at 1500 r.p.m., also, that with an air density corresponding to a compression ratio of 14 to 1, ve-

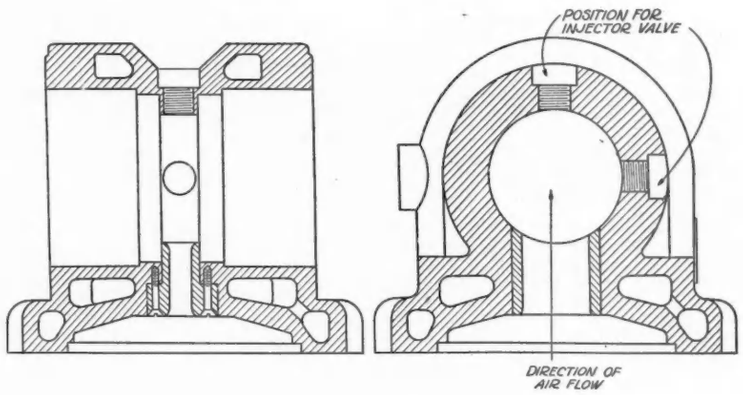


Fig. 1—This shows the type of cylinder head used in studying the effect of air flow in the combustion chamber on the dispersion of the atomized fuel. Air from the cylinder enters the head through the channel at the bottom and fuel can be injected from the top or the side + + + + +

Fuel Distribution

locities as low as 200 ft. p.s. cause appreciable deviation in the paths of individual drops.

Two series of tests were made, in one of which the direction of the air was normal to the direction of the spray, while in the other it was counter to the spray. In the first series (air flow normal to the spray) it was found that an air velocity of from 130 to 0 ft. p.s. during the period of injection gave spray photographs very similar to those obtained previously when injecting fuel into air at atmospheric pressure. An air velocity of 350 to 60 ft. p.s. carried away a small amount of fuel from the edge of the spray and there was also a slight bending of the main body of the fuel spray.

With an air velocity of 600 to 250 ft. p.s. at the start of injection, the air jet tore the fuel away from the edge of the spray, and an appreciable amount of the fuel was carried away with the air to parts of the chamber not reached by the spray. With an air velocity of approximately 800 ft. p.s. on the fuel spray, as soon as the spray reached the air jet, the latter deflected it from its original path and tended to disperse the main body of the spray throughout the chamber.

The air broke up the main body of the spray so that it destroyed the central core. The conclusion is drawn from this result that with air velocities of about 800 ft. p.s. good mixing of the fuel and air can be obtained even though the air is at a low (atmospheric) density. From the spray photographs and the results of the theoretical investigation it is concluded that, neglecting the possible effects of temperature, air velocities of approximately 400 ft. p.s. will effectively disperse the fuel from a single round-hole orifice throughout the combustion chamber of a high-speed compression-ignition engine in the time available for efficient combustion.

With the air jet directed counter to the fuel spray, with an air velocity of 100 to 350 ft. p.s., the main body of the fuel penetrated into the orifice from which the air issued. However, the fuel at the edge of the spray was torn away and blown upward toward the top of the chamber. The mixing of the fuel with the air was better in this case than with the air directed normal to the fuel spray for the same velocities. After cut-off the spray was quickly diffused throughout the spray chamber.

With an air velocity of about 600 ft. p.s. the penetration of the spray decreased and the main body of the spray became broader than with the lower velocities. Partial dispersion of the spray throughout the chamber was completed before the cut-off, although the center of the spray still penetrated into the orifice connecting the cylinder with the spray chamber.

With an air velocity of about 800 ft. p.s., the dispersion was still further improved, and the air tore considerable spray away from the main body, carrying it to the top of the spray chamber. Although the main spray still reached the orifice connecting the cylinder and the spray chamber, the spray intensity was materially decreased.

Air injected counter to the fuel spray is an effective means of dispersing the fuel spray throughout the spray chamber. However, this dispersion is obtained at a considerable sacrifice. The pressure required to give the velocity of 800 ft. p.s. is 5.4 lb. p.sq. in., and to obtain velocities of even half this much in the engine would require an even higher pressure difference between the cylinder and combustion chamber. Consequently, although air flow in the combustion chamber should materially increase the combustion efficiency of the engine, because of the better mixing of the fuel with the air, this increase may be more than balanced by the additional pumping losses of the engine. In cases where the overall efficiency of the engine is improved by the use of air flow, the increased pumping losses must be less than the gain due to increased combustion efficiency. Therefore, in designing an engine in which high air velocities are to be employed within the combustion chamber, care must be taken to keep the pumping losses as low as possible, by using smooth air passages.

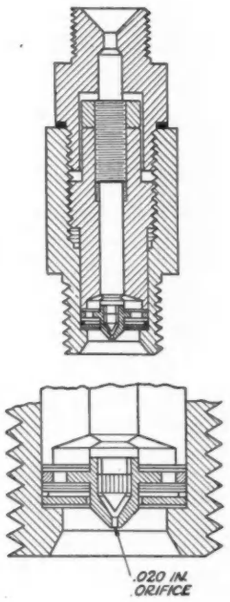


Fig. 2—Sectional view of the injection valve used in the tests + +

When air flow is produced by means of a restriction between the cylinder volume and the combustion space, the maximum air velocity occurs about 25 deg. ahead of top center. From this point on the air velocity rapidly drops to zero, except for such velocity as may persist by reason of the inertia of the air. Consequently, to take advantage of air flow so produced, injection must begin about 25 deg. before top dead center. This early injection increases the chances of early ignition and of a rapid rise in pressure.

In cylinder heads such as that used on the Tartrais-Peugeot engine, the piston is provided with a "displacer" which closes the passage between the cylinder and the combustion chamber toward the end of the compression stroke, and during the rest of the stroke the air remaining in the cylinder is forced through small holes in the displacer. By this means extremely

(Turn to page 177, please)

Books for the Business Bookshelf

Thermodynamic Fundamentals for Aircraft Engines

THERMODYNAMISCHE Rechnungs - Grundlagen der Verbrennungskraftmaschinen und ihre Anwendung auf den Hoehenflugmotor (Thermodynamic Fundamentals of Internal Combustion Engine Calculations and Their Application to High-Altitude Aircraft Engines), by Dr.-Eng. Asmus Hansen. Published by VDI Verlag, Berlin NW7, Germany.

In the first part of this research report charts are worked out giving values for the cardinal points of the theoretical diagrams, the mean indicated pressures, and the theoretical efficiencies. In the second part the data obtained are applied to the high-altitude aircraft engine. For supercharged gas and oil engines utilizing the energy of the exhaust gases, the best working processes for altitudes up to 18.6 miles are studied, as well as the attainable output, fuel consumption and weight per effective horsepower. For two-stroke high-altitude engines a new charging and discharging process by "low-pressure scavenging" is proposed.

Researches on Automobile Radiators

A COPY has been received of Forschungsheft 342 of the VDI Verlag, Berlin, entitled Untersuchung von Automobilkuehlern (Researches on Automobile Radiators), by Dr.-Ing. Karl Dehn. The researches covered in this report were made on radiator core units of the water-tube type. In the experiments, which were carried out in the Laboratory for Technical Physics at the Munich Technical College, the rates of heat transfer from the water flowing through the radiator unit to the atmosphere were determined, and measurements were made on units in which the tubes were placed one directly behind the other, and also with units in which the tubes were staggered. In addition the loss of pressure of the air in passing through the units was measured. Since both the heat transfer and the pressure drop depend on the velocity of flow of the air through the radiator, there is a close connection between heat transfer and pressure drop.

Financial Problems of Installment Selling

By Otto C. Lorenz and H. M. Mott-Smith. McGraw-Hill Book Co., New York. Price, $4.00.

ALTHOUGH this book will prove of greatest value to the finance company executive or the student of the instalment business, the first six chapters contain much information that will be enlightening to the individual dealer making use of this form of credit. These chapters explain how to determine the limits beyond which it is not safe to go in the use of this form of financing.

We recommend careful study of this book to anyone contemplating the organization of a finance company. Even if he isn't able to follow some of the intricate mathematical analyses, the book will give him a wholesome respect for the complexity of the business. There is more to it than "put and take."

Wire Springs

A BOOK on Springs recently issued by Barnes-Gibson-Raymond, Inc., of Ann Arbor, Mich., contains a good deal of information on the design and calculation of wire springs. Springs of the compression, tension and torsion types are included. Values are given for the variations in diameter of commercial spring wire and for variations in the diameter of a coil due to differences in the tensile strength and elastic limit of the material. Suggestions for working stresses of helical compression springs are also made. An important part of the book is devoted to valve springs and two formulas for the vibration frequency of such springs are given.

Commodity Marketing

By Ralph F. Breyer, assistant professor, Commerce and Transportation, University of Pennsylvania. New York, McGraw-Hill Book Co., 1931.

"MARKETING PASSENGER AUTOMOBILES" is described by Dr. Breyer in two chapters, covering 18 pages of this book. The various channels of passenger car distribution are outlined with fair clarity, the relative advantages of distributors and factory branches are exposed, and the common characteristics of the dealer contract are detailed.

For the most part the automotive chapters are accurate, both as to general concepts and as to detail, and should provide a good guide for students or young men actually in the automotive field eager to become familiar quickly with the marketing practices of the industry. They provide information of value as well to the more experienced executive in the parts or accessory field who may be interested in clarifying his general conceptions as to just how automobiles are marketed and distributed.

The author has made a mistake, we believe, in attempting to speak a bit too specifically of companies and trends in a book which is supposed to be more or less permanent in character. As a result, much of the statistical data presented in the general brief history of the industry with which he opens his discussion is already out of date.

Some inaccuracies of detail, too, appear here and there. The price range of cars he puts between $435 and $10,000; this upper limit, of course, being considerably lower than is actually the case, as many Duesenberg owners will be glad to testify.

In sketching the five major functions of the factory marketing organization, he fails to include one of the most important of all functions, namely, getting and holding dealers.

After listing the disadvantages of distributor type

of distribution as including tendency on the part of the distributor to take lines of least resistance, overemphasize easy selling models, and perhaps neglect dealers under him, etc., the author says: "These conditions run contrary to the manufacturers' interests. With a branch house they can be *easily* rectified and avoided." (The italics are ours.) Certainly, he will find more than one important sales manager disputing that point with him.

The dealer, Mr. Breyer states, commits himself in advance to take a yearly quota of cars. We don't know of any dealers today who make any such commitments for a year in advance in any detailed or legally binding manner. He points out, too, that the trend among dealers is toward reduction of multiple car representation. That was true at the time Mr. Breyer wrote his manuscript, but while it was being published the trend turned back. In 1930 the percentage of multiple car dealers increased.

One paragraph of Mr. Breyer's, we feel, should be quoted because it is one of the few in which he has taken a one-sided viewpoint. "There are thousands of independent repair stations," he says, "concerns which do not hold dealerships or 'authorized service station' licenses from any manufacturer. . . . These go their own way in matters of repair work. There is extreme variation in the quality and charges for their service and much is indifferently rendered."

Certainly this latter statement is true, but what Mr. Breyer fails to add is that the same thing may just as truly be said of car dealer service stations. The character and service of the independent shops in the United States, the increased use of flat rates systems and charges in these shops and the growth of local associations of such units has been definitely responsible for much of the growth and stability of the automotive industry as a whole. Without their existence and growth, it would have been impossible for car manufacturers to sell anything like the number of automobiles they have sold in the last 25 years. From the standpoint of both convenience and capacity, the dealer repair shops alone would have been totally inadequate to care for anything like the number of automobiles now in operation.

It is a sad truth, moreover, as Mr. Breyer states, that "manufacturers . . . . have not attempted to educate them in an organized way to render service." Some slight tendency toward such effort on the part of manufacturers in connection with independent repair shops, nevertheless, has appeared in recent months.—N. G. S.

Engine Performance at High Compression Ratios

ENGINE Performance at High Compression Ratios is the title of engineering research circular No. 6 issued by the Department of Engineering Research, University of Michigan, Ann Arbor, Mich., the author being H. E. Zuck. An N.A.C.A. universal test engine was used in the experiments on which the circular is based. It was noted that detonation, when first encountered, does not lower the power output; on the contrary, the power increases slowly until detonation becomes extremely severe, and a point is then reached where it drops off sharply. It is not advisable to operate an engine under detonating conditions except for short intervals. It put severe shock loads on all parts concerned and creates an abnormal heat condition which the engine may not be able to meet.

Assuming the engine to be operated at a constant detonation intensity, no increase in power may be obtained by an increase in compression ratio, unless the fuel is changed. If the compression ratio were to be increased and the spark reset to this constant detonation intensity, the power output would be approximately the same as before. This holds true for all compression ratios which are high enough so that the limit of detonation intensity being studied is reached before the power peak.

In a general way the tests are said to have shown that if an engine has adequate spark control it is possible to use either ordinary or superior anti-knock fuels at high compression ratios without loss of power.

The Automobile Engineer's Pocket Book

By H. Kerr Thomas. Published by E. & F. N. Spon, London and New York.

THIS is chiefly a collection of formulae used in the calculations connected with the design of automobiles and engines. The little book, however, also contains considerable tabular matter of value to the designer, as well as a number of charts, such as a chart for safe loads on helical springs. The handy form of the book (3¾ by 6¼) will commend it for use in design work.

Materials Handbook

By George S. Brady, McGraw-Hill Book Co., Inc. Second edition. 588 pages. $5.00.

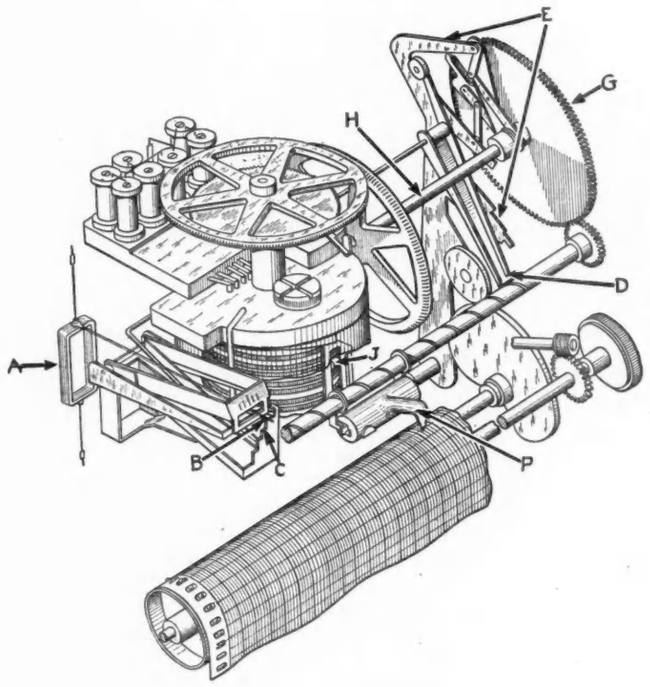
REFLECTING the progress of various industries and the introduction of new materials in almost every field, the present edition has been designed as an encyclopedia for product engineers, production executives and purchasing agents. It contains quick reference data concerning the properties and uses of various kinds of materials. In many cases this handbook will aid in identifying some of the newer products or basic materials marketed under special trade names.

The Automobile Ignition Coil

REPORT NO. 374 of the National Advisory Committee for Aeronautics deals with The Automotive Ignition Coil and has T. H. Darnell for its author. This paper gives the results of an extensive series of measurements on the secondary voltage induced in an ignition coil of typical construction under a variety of operating conditions. These results show that the theoretical predictions hitherto made as to the behavior of this type of apparatus are in satisfactory agreement with the observed facts. Automotive engineers will find in the report definite experimental results showing the effect of secondary capacity and resistance on the crest voltage produced by ignition apparatus.

CIRCULAR NO. 391 of the Bureau of Standards relates to Standard Thicknesses, Weights and Tolerances of Sheet Metal (Customary Practice). Copies may be had from the Superintendent of Documents, Washington, D. C., at 10 cents each.

Brown Potentiometer Pyrometer Has Humidity Compensator



Operating mechanism of the potentiometer pyrometer + + + + + + +

A NEW potentiometer pyrometer in indicating, recording, multiple-recording, and controlling types has been developed by the Brown Instrument Company of Philadelphia, Pa. The operation of the instrument is illustrated by the drawing reproduced herewith, in which *A* represents the galvanometer that directs mechanism serving to rebalance the circuit for each change in e.m.f. that is measured.

At intervals of a few seconds the galvanometer pointer *B* is slightly clamped. A step on the selector table *C* rests gently against the pointer and positions a rugged secondary pointer *D*. The step lever *E* periodically moves downward into contact with the secondary pointer and rotates gear *G* secured to shaft *H*. The amount of rotation depends upon the position of the secondary pointer. Rotation of shaft *H* readjusts the slide-wire contact *J* and simultaneously moves the pen *P*.

The Brown galvanometer is designed for uniformly high responsiveness under all practical operating conditions. The balancing mechanism is said to exert no strain on the galvanometer pointer and the mechanical movements of the secondary pointer are comparatively large, hence, no adjustments are needed to take up wear on either the pointer or contacting mechanism and the highest accuracy is maintained over long periods of continuous operation.

The charts and scales, which are 12 in. wide, conform to the latest calibration values for iron-constantan, chromel-alumel, and platinum-rhodium thermocouples. In order to derive full benefit from these charts, it is necessary to make suitable corrections for the natural expansion and contraction of the chart paper that takes place with changes in atmospheric humidity. It is because of this expansion and contraction that strip charts have oblong holes at one side of the paper. Such expansion and contraction can cause errors of over one per cent of the reading of some chart ranges, unless corrections are made. To eliminate such errors, a humidity compensator is built into the instrument, which automatically corrects the pen position and brings it into proper register with respect to the chart markings. Also, the charts are printed under a standard condition of humidity.

The case of the instrument is equally suitable for wall mounting, front-of-board mounting, flush type panel mounting, or table mounting. The same instrument may be procured for wall mounting and subsequently mounted flush on a panel board. The instrument door has a handle containing a lock, so that the door may be locked or not as desired.

The case is entirely enclosed and there are no openings through which the chart must extend. A reroll attachment for the chart is standard and can be used if preferred, or the chart may be allowed to accumulate in the bottom of the case. An ample expanse of the record line is always exposed to view.

The galvanometer is completely enclosed in an inside compartment with a glass window, giving it full protection from mechanical injury and from air currents when the door is open.

The galvanometer pointer and suspensions are relieved of practically all work by the introduction of a "secondary pointer" system, wherein a rugged sec-

ondary pointer assumes a position in magnified proportion to the galvanometer pointer and then governs the adjustments of pen and slide-wire contact.

The slide wire is exceptionally long (40 inches), which permits the use of a relatively large diameter wire. This reduces the effect of wear to a minimum, tends to maintain accuracy and permits more convolutions and consequently finer scale subdivisions, without increased resistance. The slide wire is in spiral form and enclosed in a glass container which can be filled with oil, insuring freedom from corrosion or fouling of the slide wire contact and further reducing wear.

The pen is moved by a stainless steel shaft with a long helical groove and is operated in conjunction with the slide-wire contact by means of a positive pawl-driven mechanism.

The long slide wire and the helical shaft pen drive, permit close settings of contact and pen with relatively large mechanical motions produced by the pawl-driven mechanism; thus the necessity for extremely close adjustments of the drive mechanism is obviated and the adjustments are not easily upset, as by wear.

Automatic control is obtained through mercury switches which can handle up to 50 amperes at 220 volts (60 amperes at 110 volts). As the mercury switches are sealed in glass, no open arcs occur and danger of fire and explosion is eliminated. The instrument may be provided with as many as three mercury switches, making it applicable to the operation of various valve control mechanisms or signal lights.

The control temperature is easily set by a knob projecting through the front of the door, which can be left in place or removed as desired.

Multiple recorders employ the same color-code which is used with other Brown multiple recorders. A new "balanced stroke" feature causes the record to be printed and the instrument connected to another thermocouple as soon as the proper balance adjustment has been reached. This results in more frequent printing and consequently more accurate and legible multiple records.

Terminals for both the thermocouple wiring and the control circuits are located in an enclosed terminal box with outlets for conduit wiring. A terminal block with a temperature equalizing metal insert is provided for the thermocouple cold junctions and compensator, to insure accurate cold junction compensation.

Stainless steel, which has become available in sheet and rod form during the last few years, is extensively used in the new Brown potentiometer because of its non-corrodible properties. Bearings are of bronze or nickel silver. The case, door and frame are enameled aluminum die castings, and the door handle with lock is chromium-plated.

Development of Light Piston Alloys

(Continued from page 163)

a start toward this condition has been made. The explanation may be found in Fig. 1, which shows that the hardness of all light alloys decreases quite rapidly with an increase in temperature.

Mr. Mahle states that the general impression, prevalent even among technicians, that cylinder wear is increased by the use of light alloy pistons, because any metallic particles worn off the piston rings, for instance, embed themselves in the soft metal of the skirt and then act as an abrasive, is quite without foundation. Accurate measurements have shown that cylinder wear is always greatest at the upper end, and the zone of greater wear ends abruptly at the lowest point reached by the bottom ring. If there were any abrasive action due to particles embedded in the piston skirt, there should be definite wear of the cylinder wall at the lower end, with which only the skirt comes in contact. Equally baseless are the assertions that a layer of aluminum oxide is formed on the surface of aluminum pistons, which forms an effective abrasive and wears the cylinder bore, and that the high silicon-aluminum alloys, in consequence of the harder silicate inclusions, lead to a more rapid wear of the cylinder bore than either gray iron or other aluminum alloys.

On the other hand, the wear of the cylinder wall is influenced to a considerable extent by the conditions of lubrication of the piston rings, which in turn is dependent on how the rings are seated in the grooves after prolonged operation. There is room for development along this line, but this work is already under way.

Air Flow in Diesel Engine Helps Fuel Distribution

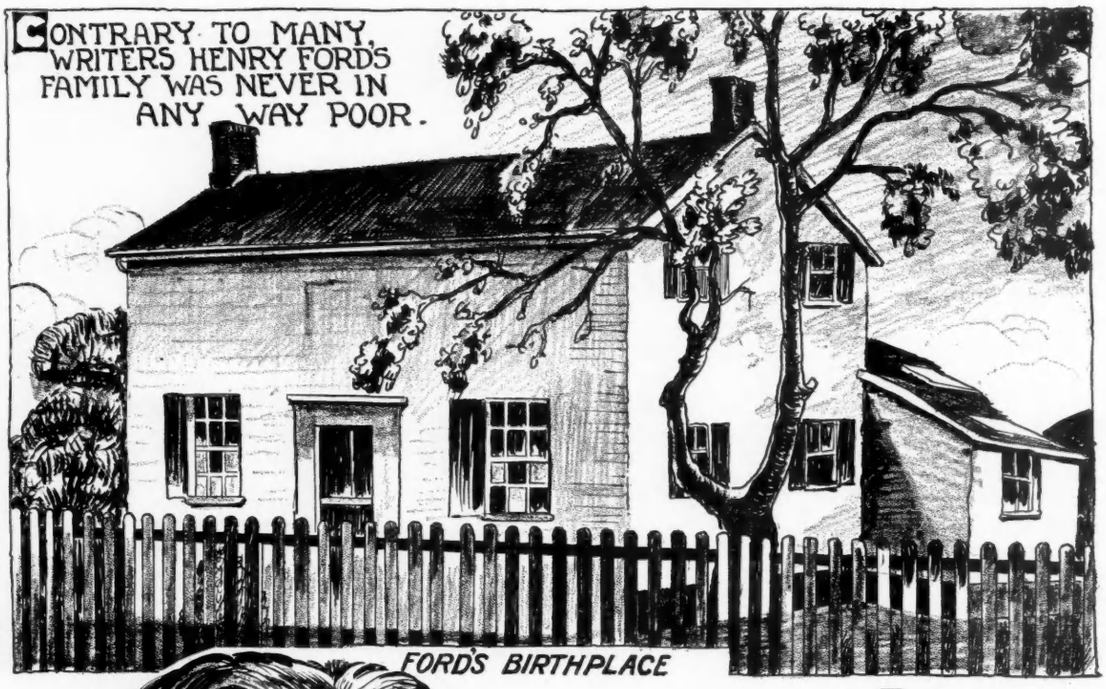
(Continued from page 173)

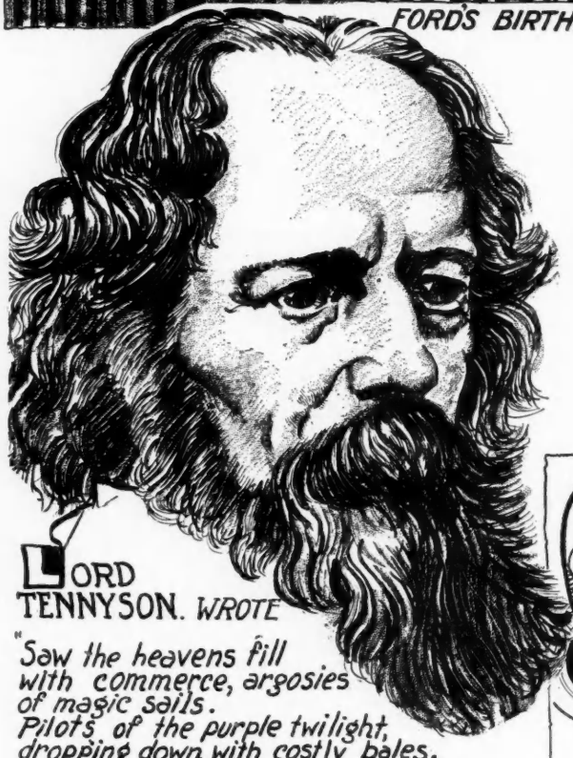
high air velocities of a small cross section can be obtained when the piston is close to the top center position, but forcing the air through these small passages involves considerable loss.

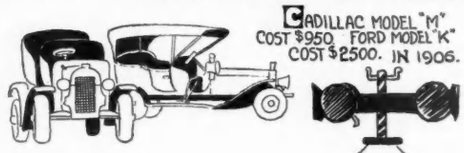
Another method consists in giving the air a definite directional motion as it enters the cylinder by vanes in the intake system. Tests made by Hesselman, Ricardo and Kemper with systems of this type have definitely proved that the air flow persists during the compression stroke, and that it decreases the fuel consumption of the engine. Mr. Rothrock says air flow produced in this manner need not be accompanied by as large a pumping loss as is experienced when the air flow is produced by the motion of the piston, since it is not a question of producing air flow, but of directing the flow of the air as it comes into the cylinder. Of course, if higher velocities be created by restricting the intake passage, additional pumping losses will result.

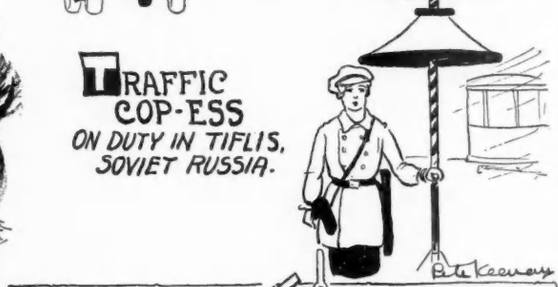
CITY gas has been used for a long time in running in automobile engines, and at the present time Cadillac, Chrysler and other Detroit manufacturers together consume some forty million cubic feet of gas for this purpose per month. The engines usually are run under load at speeds of from 750 to 1050 r.p.m. Special mixers are used to prepare the combustible mixture of gas and air, and these are said to be so designed as to decrease the richness of the mixture with an increase in speed. The power generated is less with gas than with gasoline, but there is a saving in using manufactured gas, and another advantage is said to be that the combustion chamber remains cleaner. Engines generally are run in during a period of 2 to 3 hours.

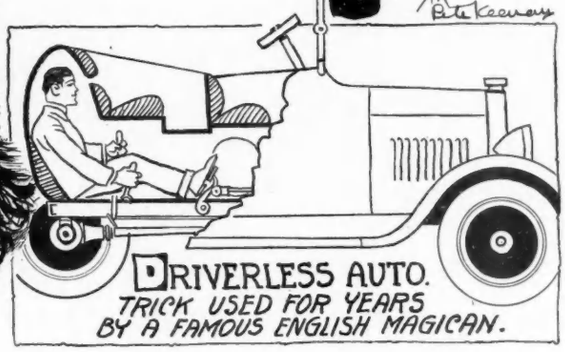
Automotive Oddities—By Pete Keenan

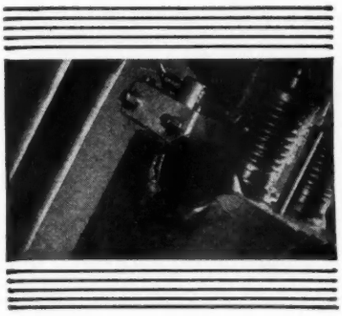



LORD TENNYSON. WROTE
"Saw the heavens fill with commerce, argosies of magic sails. Pilots of the purple twilight, dropping down with costly bales.
'In "Locksley Hall" 1842.

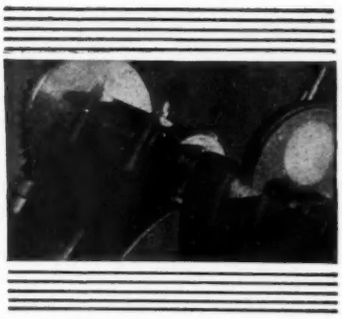








NEWS
OF THE INDUSTRY



Car Sales Off 29%

June Totals 23% Below June, 1930; Chevrolet Outsells Ford

PHILADELPHIA, July 30—Final June new-car registration figures of 201,911 bring the total for the first six months of the year to 1,177,130, as compared with 1,653,519 in the same period last year, a loss of 29 per cent. June itself was 23 per cent behind June, 1930, and 19 per cent behind May, 1931.

Chevrolet took first place in passenger car registrations in the first six months with a total of 369,907 against 391,271 in the same period last year.

The Ford six-month total was 350,801, as compared with 684,484 in the first half of 1930.

Normally about 55 per cent of the year's passenger car business is done in the first half, and consequently, if sales follow the usual trend in the second half, the total of registrations for the year will approximate 2,150,000 against 2,625,979 in 1930, and an average for the last seven years of 3,038,000.

Ford Shutdown Aug. 1

DETROIT, July 29—Practically complete shutdown of all Ford Motor Co. plants August 1 will throw approximately 75,000 men out of work here for an indefinite period.

No definite time has been set for reopening, although officials said it would be within a few weeks.

A few thousand men will be kept on the assembly line in Detroit and 11 of the 36 assembly branches throughout the country will continue on curtailed schedules, it was said.

Airports Increase

WASHINGTON, July 30—There were 206 more airports and landing fields in the United States on July 15, 1931, than there were on the corresponding date in 1930.

BUREAU OF STANDARDS scientists recently liquefied helium for the first time; it's pretty cold in this state, something down around 268.9 deg. Cent., only 4.1 deg. Cent. above absolute zero. A barrel of this juice would fill quite a bag, to put the case mildly * * * Flivvers, fire-water and the girls keep college lads from their readin', writin' and 'rithmetic, says a long, erudite report by Clarence Cook Little, former Michigan prexy. This sounds like a slap at the "two-car-family," until later in the report the learned investigator finds several curricular faults, too * * * One of our news-trailing colleagues looked into the abnormal condition of a wind cone atop a cottage on the Jersey seacoast. It marks the vacationing terminus of Harold (Autogiro) Pitcairn's "flying windmill" commuting lane from his Bryn Athyn (Pa.) plant * * * The houseorganist for Texas Oil comes through with this: Women buy more than half the cars sold, drive them more than 50 per cent of the time and buy from a third to a half of all gasoline, oil and service * * * Automotive engineers pioneered aluminum for many uses—now Pullman is building an all-aluminum car, except for wheels, brakes and springs. Some electric cars have been put in service to reduce dead weight, cutting power cost * * * A third of this year's West Point grads have hopped into jumpers and are down at San Anton' learning to fly * * * Remember the little Martin car and truck? It looks like Lee Tobin, New York, plans to produce something along this line—Tobey, it's to be called * * * Albert Russell Erskine (Studebaker, Pierce-Arrow) is chairman of a million-dollar campaign to build the Knute Rockne memorial field-house at Notre Dame * * * It takes a page and a half of typwriting to digest the speed records made by Capt. Frank M. Hawks, who, emulating his name, sails high, wide and handsome. His latest: Round trip from N. Y. to Havana—17 hrs. 3 min. elapsed time. —L. P.

THE NEWS TRAILER

British to Bring Out More "Baby" Cars

WASHINGTON, July 28—Despite the fact that the registration of "baby" cars in Great Britain showed a decline during the production year ended Sept. 30, 1930, British trade reports indicate that at least four and probably five of the leading British motor car manufacturers will shortly introduce new models of this type.

Two of these firms are not at present making small cars. Jowett is the leading make in the 7-hp. class, the Austin, M.G., Midget, Morris Minor, Singer, Jr., and Triumph in the 8 hp.; the A.J.S. and Riley in the 9 hp., and the Rover, Standard and Trojan in the 10-hp. class.

Vehicle Output Down 65,653

Car Production 61,282 Less, Trucks Off 4391, But Taxis Show Gain

WASHINGTON, July 27—Automotive production in June totaled 249,462 vehicles, compared with 315,115 in May, a decrease of 65,653, according to figures made public today by the Department of Commerce.

The passenger car output was 207,798, as against 269,080 in May; truck production dropped to 41,304, as against 45,695, while taxicab production increased to 360 from 340.

The output for June was 85,044 below that of June, 1930, and 296,470 under June, 1929.

Motor vehicle production during the first six months of 1930 and 1931 was given as follows:

1931	Number	Pass. Cars	Trucks	Taxicabs
Jan.	171,848	137,805	33,531	512
Feb.	219,940	179,890	39,521	529
March	276,405	230,834	45,161	410
April	335,708	285,028	50,015	665
May	315,115	269,080	45,695	340
June	249,462	207,798	41,304	360
Total	1,568,478	1,310,435	255,227	2,816

1930.	Number	Pass. Cars	Trucks	Taxicabs
Jan.	273,231	232,848	39,406	967
Feb.	330,414	279,165	50,398	851
March	396,388	329,501	65,466	1,421
April	444,024	372,446	71,092	486
May	420,027	360,928	58,659	440
June	334,506	285,473	48,570	463
	2,198,580	1,860,361	333,591	4,628

Marked reductions in the automobile production of Canada in June were also shown, the total output being 6835, compared with 12,738 in the month previous and 15,090 in June, 1930. Of the output, 5583 were passenger vehicles and 1252 trucks.

Motorists Pay Less for Cars

WASHINGTON, Aug. 1—The average American motorist paid $53.39 less for his automobile in 1930 than during the preceding years, according to figures just announced by the American Motorists Association.

The average passenger automobile cost $568.36 wholesale f.o.b. in 1930, while in the year 1929 the figure was $621.75.

N. S. P. A. Sanctions Cooperative Jobber Clinics, Elects Members

DETROIT, July 27—Results of the series of committee and board meetings of the National Standard Parts Association, held in Detroit during the week of July 12, include provision for the official sanction of cooperative jobber clinics, the election of twenty new members, and approval of the continued active promotion and expansion of the N.S.P.A. Maintenance Division.

Based on the recommendation from previous meetings of the N.S.P.A.-M.&E.A. Dual Committees on Service Tools and Shop Equipment, the N.S.P.A. Merchandising Committee passed a resolution, later approved by the N.S.P.A. Board, aimed at cooperative jobber clinics which have been the subject of much discussion by the entire industry during recent months.

The resolution has been passed on to the Motor & Equipment Association governing body for approval and will not be operative until adopted by that body. It provides:

1. That no member of the M.&E.A. or N.S.P.A. shall participate in any cooperative clinic unless it is sanctioned by a duly appointed Dual Sanctioning Committee of the M.&E.A. and N.S.P.A.

2. That sanctioned cooperative clinics should be supervised by a competent show manager to be appointed by the two Associations, with salary and expenses to be reimbursed from the entrance fee of the participating manufacturers which shall not exceed $25.00 per manufacturer per clinic.

3. That no cooperative clinic should be held unless it has been sanctioned at least two months in advance of the date on which it is to be held.

4. That the two associations program cooperative clinics so there shall not be more than 12 held in one calendar year, and so located that they will give the greatest possible coverage for all points in the United States and Canada. For instance, this territory should be divided into not more than 12 zones, and to insure complete coverage, the cooperative clinic should preferably rotate in the principal cities in each zone.

5. That individual jobber clinics, shows, outings, or other promotional meetings, are a subject of self-determination, provided the jobber makes no demands upon his manufacturer purveyors for cash contributions of prizes, but that he notify his manufacturers of his purpose to promote a personally financed and conducted clinic, show, outing or other promotional meeting, and leave it to the determination of each manufacturer what his attitude may be respecting the attendance of his representative or of his participation.

Further Resolved: That we are opposed to and disapprove of participation by manufacturers and jobbers in traveling clinics, shows or exhibitions. Included in the 20 newly elected N.S.P.A. members are four manufacturers whose names follow:

Manufacturers—L. W. Aff Machine Wks., San Francisco, Calif.; Gatke Corp., Chicago, Ill.; The Machined Parts Corp., Detroit, Mich.; Standard Motor Products, Inc., Long Island City, N. Y.

Hug Announces New Roadbuilder

HIGHLAND, ILL., July 25—A heavy duty 15-ton, six-wheel truck, designated as the Model 99 Hug Roadbuilder, and designed especially to meet the severe conditions of operation in a quarry, is announced by the Hug Co. This new model embodies the set-back front axle design, the Hug front spring rocker construction, a new method of front end spring suspension designed to prevent stresses and twists from being transmitted to frame and cab when traveling over uneven ground, and the Hug Multi-Cushion Triple Compensating rear springs.

It is powered by a Buda heavy duty six-cylinder, 4¾ x 6-in. engine, developing 126 hp. at 1850 r.p.m. It is equipped with a Brown-Lipe four-speed transmission and 3 speed auxiliary, making possible 12 speeds forward and three reverse and giving a total reduction in low gear of 139:1. An overdrive ratio of .747:1 with rear axle ratio of 10.26 to 1 provide an operating speed of approximately 30 m.p.h. Final drive is through a Wisconsin Model SD-410 double reduction tandem axle. Westinghouse air brakes on all six wheels are used for service braking while a 16-in. two-shoe Tru-Stop is supplied for emergency purposes.

Wood Hydraulic Three-Way Hoist

DETROIT, July 25—A new three-way hoist and dump body for any type truck chassis was recently introduced by the Wood Hydraulic Hoist & Body Co. It is offered in three models of 5, 10 and 20 tons capacity.

The hoist is of the single-unit hydraulic type, consisting of a four-section telescopic cylinder with an oil pump and reserve tank built in. This cylinder, mounted on double trunnions, applies lifting power direct to the body center through another trunnion.

Vought Brings Out Fast Navy Airplane

HARTFORD, CONN., July 28—A new Vought Corsair, with many improvements which, it is said, will make it the fastest service type of airplane built for the Navy, was announced today by the Chance Vought Corp. in East Hartford.

Performance figures for the new ship, which is designated as the O3U-2, are not available because of restrictions, but a close observance of the ship as it passed buildings in East Hartford, placed the speed in level flight as between 170 and 175 m.p.h.

Not only is the new Corsair an exceedingly fast airplane, but its performance in spinning and stalling is called remarkable, exceeding expectations of its designers. It has made fifteen complete turns in a spin with immediate recovery.

Jordan Receivers May Borrow Cash

CLEVELAND, July 28—Receivers for the Jordan Motor Car Co. have been authorized by Cleveland Common Pleas Court Judge John B. Harris to borrow $100,000 on receiver certificates, which will become a first lien on assets of the company, except for statutory claims.

Receivers also were permitted to manufacture 262 automobiles for Feiz Motor Sales, Inc.

George B. Essex

George B. Essex, retired Essex Brass Co. president, died of heart trouble July 23 as he played cards with friends at a billiard club, 528 Woodward Avenue. He was 60 years old.

Coming to Detroit from his birthplace, Springfield, Ohio, 40 years ago, he founded the brass company. He retired 12 years ago.

L. A. Young Profits $609,029, 6 Months

DETROIT, July 27—L. A. Young Spring and Wire Co., has reported net profit of $609,029 for the first six months of 1931, against $1,080,654 for the first six months of 1930.

Net profit for the second quarter this year was $376,129 compared with $563,769 for the same quarter last year.

Budd Announces Snapgard

NEW YORK, July 28—Budd Wheel Co. has introduced a stainless hub cap as a companion to its snap spokes, which will be merchandised under the name of Snapgard. The Snapgard fits snugly around the hub cap of the wheel, adding to the appearance of the wheel and keeping out dirt, gravel and cinders which tend to mar the paint work around the hub cap.

Men of the Industry and What They Are Doing

Detroit S. A. E. Names Officers

DETROIT, July 27—The new governing board of the Detroit Section, Society of Automotive Engineers, is composed of O. T. Kreusser, chairman; George Allen, secretary; F. W. Marschner, treasurer; E. S. MacPherson, chairman passenger car activity; R. F. Anderson and J. W. Votypka, chairman and assistant of body activity; W. Pritchard and R. DuBois, chairman and assistant of aeronautic activity; Alex Taub and Robert Janeway, chairman and assistant of student activity; E. Reeser, chairman entertainment committee, and J. Schermerhorn, Jr., editor of the "*Detroit Supercharger.*"

Mr. Kreusser has announced that the activities of the section will open up in October with a national production meeting, and continue monthly as in the past. Mr. Taub is in charge of a series of meetings for technical students in the universities and colleges in and about Detroit.

Count Sakhnoffsky Joins Auburn Staff

Count Alexis de Sakhnoffsky has been appointed as counsel to the body design staff of the Auburn Automobile Co. by Herbert Snow, vice-president in charge of engineering.

Sakhnoffsky is internationally known and is considered an authority on color and line. He was art director for five years for the Van Den Plas Co., leading coach builders of Brussels, and in that period won five consecutive Grand Prix awards at Monte Carlo elegance contests and one at Bournemouth, England, for automobile body designs.

A special body which he designed for the Cord front-drive car won the Grand Prix at Paris, Monte Carlo and Beaulieu in 1930.

Three Are Added to Bendix Detroit Staff

A. E. Young and George S. Sarver, representatives, and R. H. Casler, field engineer, have been named associates of R. L. Morrison, district sales manager of Bendix-Westinghouse Automotive Air Brake Co.

Kimball is Promoted

American-LaFrance & Foamite Corp. has announced the appointment of Norman F. Kimball, formerly advertising manager, as assistant to F. R. VanRensselaer, vice-president in charge of sales. T. O. Young succeeds him as advertising manager.

E. E. O'Neill, former Cleveland district manager, has been appointed manager of industrial fire equipment sales.

This company has also brought out a 12-cylinder V-type engine designed for motor fire apparatus, developing 244 hp.

Keilholtz Joins Montgomery-Ward

L. S. Keilholtz, who has been affiliated with Charles F. Kettering of General Motors Research Corp. for the last 19 years, has been appointed head of the new combined research department of Montgomery-Ward Co., Chicago mail order house.

Mr. Keilholtz has also been associated in the past with Fairbanks-Morse, the Thomas B. Jeffrey Co., predecessor to Nash Motors, the Delco Co. and the Frigidaire Co. He is an active member of the S.A.E.

Russell Wins Ford Reliability Tour

DETROIT, July 27—The National Reliability Air Tour ended at Ford Airport Saturday with Harry Russell, piloting a Ford tri-motor, again the winner of the Edsel Ford trophy. Russell finished first in last year's race.

The ten leading contestants finished as follows: Harry Russell, Ford, 63,764; James Smart, Ford, 53,814; Eddie Schneider, Cessna, 44,343; L. R. Bayles, Gee-Bee, 44,106; Jack Story, Buhl, 42,910; William Lancaster, Bird, 40,992; Lee Gehlbach, Bird, 40,227; Eddie Stinson, Stinson Junior, 38,237; Joe Meehan, Great Lakes, 36,167, and George Dickson, Aeronca, 32,514.

L. R. Bayles, piloting a Gee-Bee, was awarded the Great Lakes trophy for light planes.

Urges License Reciprocity

NEW YORK, July 24—Greater extension of reciprocal license agreements for vehicles operating in other states than those in which registered, was urged by Edward F. Loomis, secretary of the Truck Committee of the National Automobile Chamber of Commerce, speaking at Portland, Me., before a group of commercial vehicle operators at the local Chamber of Commerce last evening.

Mr. Loomis, at last night's meeting, wound up a series of visits to New England cities, extending throughout the past week, during which he visited Bangor and Rockland, Me., Concord, N. H., Boston, Mass., and Providence, R. I.

Harry B. Harper, whose appointment as Sales Manager of Willys-Overland Co. was announced last week in Automotive Industries

Dodge Promotes Paul

O. J. Paul has been appointed regional manager of the Chicago region for Dodge Brothers Corp., according to an announcement by A. vanDerZee, general sales manager. Mr. Paul comes to his new position from Kansas City, where he served as manager of that region for some time. He is succeeded in Kansas City by C. E. Warner, formerly sales representative in New York City.

Tariff Increased

WASHINGTON, June 25—Effective June 16, 1931, the duty on automobiles and on trucks of less than 3360-lb. carrying capacity imported into British East Africa (Kenya, Uganda and Tanganyika Territory) was increased from 10 per cent to 15 per cent ad valorem, and the duty on rubber tires was increased from 25 to 50 East African cents per lb.

Checker Cab Shows Profit

NEW YORK, July 20—Checker Cab Mfg. Corp. reports net profit for the first six months of the current year of $73,951.

Mill Concentrates In Detroit Area

Independent Announces Change in Policy : Detroit Basing Price Established

NEW YORK, July 30—Announcement that the leading "independent" company specializing in automobile sheets will concentrate production at its Michigan plant and introduction of a Detroit basing price on steel bars were outstanding developments of the week, serving to emphasize the predominant position of automotive consumption in the steel market.

A Detroit basing price of $1.75 on steel bars has become fully established. The prevailing Pittsburgh base price is $1.60, and it is supposed that the Detroit base price will normally remain $3 a ton above the Pittsburgh price, whatever the latter may be.

The coming of a Detroit basing price is generally attributed to a desire on the part of Pittsburgh and Youngstown mills to overcome the competition of mills close to Detroit that were making delivered prices. F.o.b. mill prices were thought less efficient to meet this situation than a Detroit base price by which different freight rates from Pittsburgh and Youngstown, depending upon whether shipments are made by rail or by rail and water and by water from Lake front mills are equalized.

Cold-finished steel bars have not been affected by the innovation. There is talk of Detroit becoming a price-basing point for sheets. With shipments of sheets at old prices coming to an end this week, the real test of the market is looked for next week.

Pig Iron—The market is decidedly quiet, very little in the way of representative tonnage sales being recorded. Prices are nominally unchanged.

Aluminum—The sole domestic producer is suspending operations at one of its plants, but the larger works continue in operation. The market is quiet and prices are unchanged.

Copper—Dull with the "official" price continuing at 8c, but custom smelters quoting 7¾c, delivered Connecticut, and 7⅞c, delivered Middle West.

Tin—The market is marking time, the general inclination being to await further developments. Straits tin was quoted at 24.15c at the week's beginning.

Lead—Demand is light. Prices unchanged.

Zinc—Easy and unchanged quotably.

Proposes to Buy Federal Aviation

NEW YORK, July 28—An offer to purchase all assets of the Federal Aviation Corp. has been made by the National Aviation Corp., a deal which would mark the departure of National Aviation from the investment trust field exclusively and put it into the aviation operating business.

The principal asset of Federal Aviation is a 92½ per cent interest in the Washington Air Terminal Corp.

National Aviation has offered to make this purchase through the medium of its own stocks and warrants and will accept in exchange securities held by Federal Aviation which had a market value on June 30 of $421,000.

Willys Profit Is $304,648 for 6 Months

TOLEDO, July 27—Net profit of $304,648 after expenses and taxes was earned by Willys-Overland Co., on $26,656,997 net sales in the first half of 1931, it was reported by L. A. Miller, president, in the semi-annual financial report to the stockholders.

Gross profit, after deducting cost of sales, including depreciation, was $3,441,363, and there were other profits, including $133,541 interest earned and $111,972 federal tax recoveries.

LeBlond-Schacht Adds 10-Ton Tractor Truck

CINCINNATI, July 28—A new 10-ton tractor truck, designated as Model TRH, has just been added to the line of LeBlond-Schacht Truck Co. This new unit, offered in three standard wheelbases, 148, 168 and 174 in., is powered with a Hercules six-cylinder 4⅝ x 4¾-in. engine, developing 103 hp. at 2200 r.p.m. This model is also available with a Waukesha six.

Engine accessories include a Hall-Winslow oil filter and Monarch governor. The engine is mounted in unit with a multiple-disk clutch and a five-speed transmission. Electrical equipment is furnished by Auto-Lite and carburetion by Zenith.

Final drive is through a Timken full-floating bevel axle having a gear ratio of 7 4/5 to 1. The braking system comprises four-wheel hydraulics, actuated by a booster for service, and a four-shoe Tru-Stop disk mounted in back of the transmission for parking.

The frame, 7 x 3 x ¼ in., is pressed steel reinforced with 9-in. fish plates, ¼ in. thick. Budd disk wheels with 9.00/20 balloons, duals in rear are standard equipment and 9.75/20 tires are optional at extra cost.

In addition to a 28-gal. tank under the seat an auxiliary tank of 35 gal. is mounted on side of the frame. When sleeper cab is furnished a 100-gal. tank can be mounted in cab at extra cost.

Trucking Companies Fight New Tax Law

SPRINGFIELD, ILL., July 29—Freight trucking companies, incorporated in other states, have begun court fight against the new Illinois motor vehicle fee which increases licenses for carriers in the second division, carrying freight or passengers over a fixed or definite route, from $1 to $1.50 for each hundred pound gross weight.

The out-of-state corporations affected by the suit assert that the legislature intended the act to apply only to trips originating and terminating in the state but that officials are attempting to enforce its provisions against them and that they do not operate on a fixed or definite route merely by private contract and are not public or common carriers within the meaning of the act.

The new law, they allege, is unconstitutional because it imposes a double tax.

Stutz Bearcat Revived

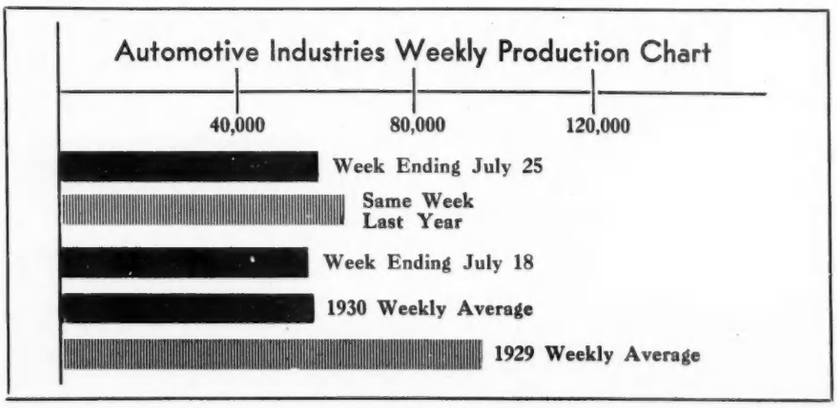
INDIANAPOLIS, IND., July 28—The Stutz Motor Car Co. has added to its line a roadster known as the Stutz Bearcat. This revives a model name used by the Stutz company some 15 years ago. The new roadster, which is equipped with the Stutz 32-valve engine, is guaranteed to do 100 m.p.h.

State Cars Cost 3.2c Per Mile

DES MOINES, IOWA, July 29—Cost of operating and replacement of 31 cars and three trucks used by the department of agriculture over the past two years was 3.2 cents a mile, according to figures compiled by the department.

Eaton Axle Profit 81c

NEW YORK, July 28—Eaton Axle & Spring Co. and subsidiaries including Wilcox-Rich Corp. and Reliance Mfg. Co., from the dates of the acquisition showed net profit for the first six months of the current year of $564,171 after all charges, minority interest and dividend requirements on Wilcox-Rich Corp. class A stock. This is equivalent of 81 cents a share on Eaton Axle stock.



Summary of Current Automotive Financial Reports

Company	Term, 1931	Current Report Net	Current Report Per Share	1930 Report, Like Period Net	1930 Report, Like Period Per Share
Auburn	Mar., April, May	$ 2,158,764.98*	$11.06	$ 769,385.00*	$3.94
Aviation Corp.	1st Half	729,480.00	(Net Loss)	3,236,318.00	(Net Loss)
Bohn Al. & Brass.	1st Half	925,585.00*	2.62	688,766.00*	1.95
Bohn Al. & Brass.	2nd Quarter	486,337.00†	1.38	439,221.00†	1.24
Budd Wheel	1st Half	485,201.00†	.44		
Budd Wheel	2nd Quarter	271,122.00		214,079.00	
				(First quarter, 1931)	
Campbell, Wyatt, Cannon Fdy.	1st Half	269,000.00†	.85	583,469.00†	1.68
Caterpillar Trac.	1st Half	1,446,476.00*	.77	5,622,965.00†	
Checker Cab	1st Half	73,951.00*			
Chicago Pneu.	1st Half	10,179.00*	.05	287,771.00*	1.53
Du Pont	1st Half	27,610,394.00	2.23	32,951.314.00	2.84
Eaton Axle	1st Half	564,171.00*	.81		
Edw. G. Budd	1st Half	139,565.00†			
Edw. G. Budd	2nd Quarter	102,545.00		20,691.00†	
				(Whole of 1930)	
General Motors	2nd Quarter	55,122,767.00†	1.22	53,386,768.00†	1.17
General Motors	1st Half	84,122,176.00†	1.83	98,355,355.00†	2.15
Hudson	1st Half	526,992.00	.33	3,392.012.00	2.12
Hupp Motor Co.	2nd Quarter	369,198.00 (Loss)		442,304.00	.29
Hupp Motor Co.	1st Half	1,077,110.00 (Loss)		509,053.00	.33
Johns Manville	2nd Quarter	715,657.00*	.78	998,529.00†	1.16
Motor Products	2nd Quarter	164,234.00*	.84	370,220.00*	1.37
Motor Products	1st Half	257,121.00*	1.31	602,239.00*	3.05
Packard		(Declared 10c quar. div.)			
Perfect Circle	1st Half	494,662.00†	3.04	368,057.00†	2.26
Pierce-Arrow	1st Half	421,711.00*	.04‡		
Stewart-Warner	2nd Quarter	110,937.00	.08	872,852.00	.67
Studebaker	1st Half	2,029,354.97	.91	2,258,702.17	1.03
Studebaker	2nd Quarter	1,219,605.30	.56	915,274.96	.41
United Corp.	1st Half	76,440.00*	.30	46,372.00*	.18
Willys-Overland	1st Half	304,648.00			

* Profits.
† Earnings.
‡ Class B Stock.

Budd Earnings Gain

NEW YORK, July 28 — Edward G. Budd Mfg. Co. reports net earnings for the first half of the current year of $130,565. Earnings during the second quarter were $102,545 and compare with earnings for the whole of 1930 of $20,691.

Stewart-Warner Profit 8c Share

NEW YORK, July 28 — Stewart-Warner Corp. reports net profit for the second quarter of the current year of $110,937. This is equal to 8 cents a share on capital stock and compares with profit of $872,852, or 67 cents a share for the second quarter of last year.

For the first half of the current year, the company shows a loss of $220,819, compared with a profit of $1,582,863 or $1.17 a share for the first half of last year.

Chevrolet Fleet Sales Up

DETROIT July 28—During first six months of this year Chevrolet Fleet sales, including passenger cars and trucks, increased 9.4 per cent over same period last year, 71 per cent over same period 1929 and within 2000 units of equaling figure for full year 1929.

Hudson Adds Sedan

DETROIT, July 28—Hudson has added a special three-window sedan, listing at $1,325.

Hupp Loss Reported

NEW YORK, July 30—Hupp shows quarter's loss $396,198. Compares with profit $442,304, or 29 cents a share, for corresponding quarter last year. Six months' loss is $1,077,110 as compared with profit of $509,053 last year, or 33 cents a share.

DuPont Earns $2.23

NEW YORK, July 25—DuPont reports earnings for first half of 1931 $27,610,394, equivalent after preferred dividends to $2.23 a share on common. Earnings from G. M. investment are $14,971,465, or $1.35 per DuPont share. Figures compare with total earnings for first half last year—$32,951,314, or $2.84 per share, of which $17,965,065, or $1.70, derived from G. M. investment.

Packard Declares 10c

NEW YORK, July 28—Packard has declared quarterly dividend of 10 cents payable Sept. 12 of record Aug. 15.

United Carr Profit is 30c

NEW YORK, July 27—The United Carr Fastener Corp. reports profit for the six months ended June 30 of $76,440. This is equivalent to 30 cents a share on common stock, and compares with earnings of $46,372, or 18 cents a share, for the first half of last year.

Profit for the June quarter was $74,645, or 29 cents a share, as compared with $67,224, or 27 cents a share, for the corresponding quarter of last year.

Develops Brake Block

NEW YORK, July 28—Durwyllan Co. of Paterson, N. J., has developed a new type of brake block which they will market under the name of Triplewear.

Studebaker Keeps Open

SOUTH BEND, IND., July 28—Studebaker plants will not be closed for the summer vacation period this year.

Studebaker Shows 33% Profit Gain

SOUTH BEND, IND., July 27—Net profits of The Studebaker Corp. and subsidiary companies, after reserves for Pierce-Arrow minority stockholders' interest, for the quarter ending June 30, 1931, were $1,219,605.30 as compared with $915,274.96 last year, a gain of $304,330.34, or 33.3%. The amounts remaining for Studebaker Common, after preferred dividends, were 56c per share this year as against 41c last year.

Net profits for the first half, were $2,029,354.97 this year as compared with $2,258,702.17 last year. These provided 91c and $1.03 respectively, for the common stock.

Sales in units were larger in the second quarter than they were last year, but the amount of sales was 15.6% less. This means, of course, that our ratio of net profits to sales was considerably better in the current quarter, the result of economies effected in the meantime. In addition, larger reserves and absorptions were deducted from earnings this year.

The financial position of the corporation as of June 30 shows substantial improvements since January 1 in quick assets, working capital and in reductions of property investment account, current liabilities, minority stock interest, and Studebaker preferred stock.

Working capital was increased to $21,484,974.79 from $19,438,646.60, with a ratio of quick assets to current liabilities of 568 per cent, the best in 15 years, and an improvement of 100 per cent from Jan. 1, 1931. All bank loans were paid off during the period.

Lee Tobin Corp. to Make Tiny Truck

NEW YORK, July 28—The Lee Tobin Corp. has been organized with a Delaware charter for manufacturing the Toby Truck. This truck will be distributed through a subsidiary organization, the Lee Tobin Distributing Corp.

The Toby truck will be powered with a Continental 4-cylinder 30 hp. engine, having a bore of 2¾ in. and a stroke of 3 5/32 in., or a total displacement of 74 cubic inches.

The Toby is a small truck, having a total height of 62 in., an all-over length of 90 in., with a wheelbase of 60 in., and track of 48 in. Its carrying capacity will be 800 lb. and the truck itself weighs 800 lb. Loading space will be 78 cubic feet.

The truck incorporates the Martin individual wheel suspension, all four wheels being attached direct to the body with aviator's cord, and there being no chassis in the regular sense of the word. The truck will be assembled for the Lee Tobin Corp. by the Selden-Hahn Truck Corp., and will sell at $450 f.o.b. Hamburg, Pa.

Auburn Announces 7-Passenger Sedan

AUBURN, IND., July 27—A seven-passenger sedan built on a 136-in. wheelbase and provided with additional comforts as compared with the standard line, has been added by Auburn. The price is $1,395.

The auxiliary seats are 22½ in. wide and are placed close together, and it is

Interior of new Auburn sedan finished in tailored broadcloth

stated that their combined width of 45 in. is sufficient to seat three people without discomfort. Both are 14½ in. deep and stand 12¼ in. from the floor.

Interior lining upholstery is in a tailored broadcloth. Carpeting is Biglow Hartford in a harmonizing color. Moldings on the standard model are in an ebony finish and on the custom sedan in a walnut. Custom models include toggle grips, torchiers, dome lights, robe rails, and vanities. The framework of the body is of seasoned ash and steel, paneled with steel. Front and rear doors on both sides measure 32⅜ and 28⅝ in. respectively. Paneling of body and doors is insulated on the inside against temperature changes and noise.

New York Collects $30,000,000 Gas Tax

ALBANY, July 28—The motor fuel tax netted New York State more than $30,000,000 for the fiscal year ended June 30, and about five and a quarter millions of dollars more than last year.

The collection figures indicate that the gross and the net collections month by month exceeded the same months of the preceding year with the exception of February and June, 1931, when the collections fell off.

Bank interest on the collections brought more than $60,000 into the state's coffers. A singular feature of the motor fuel tax report was the fact that dishonored checks outstanding at the end of the year totaled only $1,682.79 and are all regarded as collectible.

No major changes were made in the road mileage in the counties; therefore the latest distribution, in proportion, was practically the same as the three which preceded the July apportionment.

Northrop, Stearman Aircraft are Merged

CHICAGO, July 28—Consolidation of the Northrop Aircraft Corp. of Burbank, Cal., and the Stearman Aircraft Co. of Wichita, Kan., was announced today by F. B. Rentschler, president of the United Aircraft and Transport Corp., which controls both concerns. All assets and engineering personnel of the Northrop plant will be transferred to Wichita within 60 days, he said.

Bosch Developing Aero Ignition System

SPRINGFIELD, MASS., July 30—An aviation ignition system developed by Robert Bosch A. G., Stuttgart, with the cooperation of American representatives, is expected to be ready for production late this year, and its manufacture for the American market will be undertaken at the United American Bosch factory here.

It will make use of a battery and a voltage-regulated generator and will be applicable to a wide range of craft from a two-cylinder engine on a tiny glider to a 12-cylinder engine on a combat plane.

It will also furnish current for lighting.

Kellet Gets Type Certificate

Kellett Aircraft Corporation of Philadelphia announce the issuance to them by the Department of Commerce of Approved Type Certificate No. 437 for the K2-2 Autogiro.

The Kellett autogiro as now being delivered by the factory is showing 8 to 10 m.p.h. more speed than the ships demonstrated earlier in the year. This is due to improved streamlining, which has also greatly enhanced the appearance of the machine.

Thermoid Profits Up

NEW YORK, July 28—Thermoid Co. and subsidiaries report sales for the second quarter of the current year as 65 per cent over the first quarter of the year. Profits after all charges for the month of April were $13,768 and for the month of May were $45,333. Complete figures for June are not yet available.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, July 30 — General business continued under the influence of the usual mid-summer dullness last week. Wholesale and jobbing lines were very slow. Sales of seasonal goods were fair, but special clearance sales by retailers met with only moderate success.

CONSTRUCTION

Construction contracts awarded in 37 Eastern States during June, according to F. W. Dodge Corp., totaled $331,879,700, as against $306,079,100 during May, and $660,573,400 a year ago. Contracts awarded during the first half of this year amounted to $1,808,226,800, as against $2,638,013,300 during the corresponding period last year.

EXPORTS

Merchandise exports during June amounted to $187,000,000, as against $294,701,000 a year ago. Imports amounted to $176,000,000, as against $250,343,000 a year ago.

COMMERCIAL FAILURES

Commercial failures during the first half of this year were the highest on record. According to R. G. Dun & Co., the number of failures was 15,113, with a total indebtedness $370,497,369, as against 13,771 failures with a total indebtedness of $337,089,083, in the corresponding period last year.

COTTON

The number of cotton spinning spindles in place on June 30 was 32,881,468, of which 25,798,910 were operated at some time during the month, as against 26,397,906 during the preceding month, and 27,659,308 a year ago.

CAR LOADINGS

Railway freight loadings during the week ended July 11 totaled 763,581 cars, which marks an increase of 95,702 cars above those during the preceding week, but a decrease of 152,404 cars below those a year ago and a decrease of 302,833 cars below those two years ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended July 25 stood at 69.8, as against 70.4 the week before and 70.6 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended July 27 were 21 per cent below those a year ago.

STOCKS

The stock market last week was very dull, with the volume of transactions the smallest in some time. Sales on four of the six days fell below one million shares. Price changes for the week were irregular and within a narrow range.

BROKERS' LOANS

Brokers' loans in New York City during the week ended July 22 declined $14,000,000, bringing the total down to $1,416,000,000, as against $3,226,000,000 a year ago.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended July 22 showed an increase of $20,000,000 in holdings of discounted bills and a decrease of $3,000,000 in holdings of bills bought in the open market. Holdings of Government securities remained unchanged. The reserve ratio on July 22 was 84.3 per cent, as against 84.1 per cent a week earlier and 84.2 per cent two weeks earlier.

Reginald F. Williams

Reginald F. Williams, New York representative of the Autocar Co., died suddenly last week from a heart attack at his home in Queens. He is survived by his widow, his mother, three sisters and three brothers.

G. M. Signs Up For Exposition

Is First Industrial Concern To Enter Chicago World Show With Special Building

DETROIT, Aug. 1—Contracts authorizing erection of a special building at a cost of close to $1,000,000, to be devoted exclusively to the display of General Motors products at Chicago's International Exposition in 1933, have been signed.

Albert Kahn, architect, is now drawing up plans for the structure, which will have 100,000 sq. ft. of display space and will be strategically located on the lake shore opposite Thirty-first Street, one of the main entrances to the Exposition grounds, in the transportation center.

A complete automobile assembly line in constant operation is one of the attractions planned for the new structure, which also will contain the complete lines of all General Motors products, W. S. Knudsen, president of Chevrolet Motor Co., said. This corporation is the first industrial concern to contract for the erection of a special display building on the Exposition grounds, officials said. Mr. Knudsen heads a committee of General Motors executives who will have charge of the project.

Budd Affiliate Doubles Business

NEW YORK, July 27—Pressed Steel Co. of Great Britain, Ltd., an affiliate of the Edward G. Budd Co. of Philadelphia, reports sales for the first six months of 1931 as double those of the same period of 1930.

The British company manufactures bodies and body parts and now supplies four British motor car companies.

Perfect Circle Sales Largest in History

HAGERSTOWN, IND., July 27—Perfect Circle sales in June were the largest in the company's history, making a gain of 43 per cent over June, 1930.

June replacement sales, through automotive equipment wholesalers, again established a new monthly record with an increase of 76 per cent over June, 1930. Replacement sales for the six months' period also established a new record with a gain of 57 per cent over the first six months of 1930.

Yellow Truck Net Loss Reported Less

NEW YORK, July 27—Yellow Truck & Coach Mfg. Co. reports net sales for the first six months of the current year of $13,801,166. Net loss, after provision for depreciation, for the period was $1,046,881, as compared with a profit for the corresponding period of 1930 of $1,437,863.

Chrysler Earns 51c in 6 Months

NEW YORK, July 27—Chrysler Corp. reports net profit for the second quarter of the current year of $3,231,962. This is practically the same as the corresponding quarter of last year when profits were $3,228,139. Earnings for each quarter are equivalent to 73 cents a share on common stock.

Six months' earnings were $2,252,035, or 51 cents a share, as compared with $3,408,856, or 77 cents a share, during the first half of 1930.

G.E. Orders Over $141,000,000

SCHENECTADY, July 28—Orders received by the General Electric Co. for the first six months of 1931 amounted to $141,428,978, compared with $190,313,758 for the corresponding period last year, Gerard Swope, president, announced recently.

Sales billed for the six months of 1931 amounted to $141,180,091.13, compared with $197,229,346.82 for the corresponding period last year.

Profit available for dividends on common stock of the first six months of 1931 was $21,523,722.88, compared with $29,273,276.14 for the first six months last year. The profit available for common stock for the six months is equivalent to $0.75 per share in 1931 and $1.01 per share in 1930 on the 28,845,927 shares outstanding in both periods. The quarterly dividend is 40 cents a share.

The stockholders to whom the July dividend is to be distributed total 133,163 compared with 116,750 at the end of 1930 and with 88,408 a year ago, an increase of 50 per cent over a year ago.

200-Car Driveaway Staged at Willys Plant

TOLEDO, July 28—Two hundred cars were driven away from the Willys-Overland plant here last week by representative dealers of the Rea-Seagert Co., Pittsburgh, and the F. Wilking Sons Co., Zanesville, Ohio. The dealers came in on a special train, had breakfast at the administration building, took out the cars and stopped at Cedar Point for an outing in the afternoon.

Harry P. Branstetter

Harry P. Branstetter, 55, active in Chicago auto trade circles for many years, died suddenly on July 22 at his apartment. He suffered a sunstroke July 18 while attending the Arlington races and the shock proved fatal. He had been identified with Chicago's auto row for 30 years.

Buick Inventory to Be in September

FLINT, July 28—Annual inventory of the Buick Motor Co. plant will be taken in September of this year instead of in December, as has been usual in past years.

This change in the inventory period is made in accordance with the previous announcement by Buick that the customary midsummer model change would be deferred to conform with the suggestion of the National Automobile Chamber of Commerce for a uniform new model policy in the industry.

Production of the 1931 Buick straight eight will be continued throughout the summer months and no new Buick models will be available prior to December. He points out that the current Buick has met with such widespread acceptance and satisfaction by the motoring public that the advancements it embodies will continue to be made available to buyers down to the time of the new announcement period.

Dodge Announces Coupe, Roadsters

DETROIT, July 28—Dodge Brothers announce the addition of three new de luxe models to their line of six and eight-cylinder passenger cars—a five-passenger coupe on the new Dodge eight chassis and two roadsters, available on the new six and new eight chassis.

The coupe is long, rangy and low to the ground. The interior is upholstered in deep, rich mohair or Bedford cord in shades that harmonize with the color scheme selected. It is appointed with padded arm rests, assist cords, nickel hardware, silk window curtains, smoking sets and floor rugs.

Both roadsters have the new Dodge positive easy-shift transmission. Free wheeling is optional equipment.

Uses Ross Steering Gears

PHILADELPHIA, July 28—Ease of steering the Marmon-Herrington four- and six-wheel-drive trucks, announced by *Automotive Industries* on July 11, is made possible by the use of Ross roller-mounted steering gears, manufactured by the Ross Gear & Tool Co., Lafayette, Ind.

Detroit Gasoline Down 3c.

DETROIT, July 27—New low prices for gasoline will prevail here this week when reductions of 3 2-10 cents a gallon will be put into effect by three companies. Reductions were announced Monday by Standard Oil Co., Sinclair Refining Co., and Gulf Refining Co.

The new price for Gulf gasoline will be 11.6 cents a gallon for the regular gasoline, and 14.6 for ethyl gasoline. The prices for Gulf gasoline are effective in Detroit only.

Alabama Carrier Act Doubles Tax

$100,000 Will Be Taken From Truck and Bus Operators, Official Says

BIRMINGHAM, ALA., July 28—Alabama's new act regulating operation of common carrier trucks and buses, or motor vehicles which operate over fixed routes between given termini, will yield an annual income of approximately $100,000 to the state and counties, according to J. O. Hamby, chief of the motor transportation division of the Public Service Commission. The act became effective July 15.

Operators must pay upon a mileage basis in lieu of a gross revenue basis as was formerly the case.

Mr. Hamby estimated that $50,000 would accrue to the state and counties annually from passenger bus operations as compared with about $35,000 which was realized under the old act. The remaining $50,000 will be derived from common carrier truck operations, Mr. Hamby estimated, if all common carrier trucks that are now operating continue their operations through the year. The income from common carrier freight truck operations under the old act yielded only about $4,000 a year.

The mileage tax on passenger buses is as follows: Sixteen passengers or less, one-fourth cent a mile; 17 to 20 passengers, inclusive, one-half cent a mile; above 20 and not exceeding 25-passenger capacity, three-fourths cent a mile, and for buses of over 25-passenger capacity one cent a mile.

The mileage tax for freight trucks places a charge of one-half cent a mile on all vehicles transporting property with a rated carrying capacity of less than 2 tons; three-fourths cent on vehicles of 2 tons or more but less than 3 tons; one cent on vehicles of 3 tons or more but less than 4 tons; one and one-half cents for vehicles of 4 tons but less than 5, and two cents per mile for vehicles of 5 tons or more. The load is limited to 50 per cent above the rated capacity of the vehicle.

The records of the commission reveal that already two freight truck carriers have abandoned operations on account of the mileage tax law enacted by the legislature.

Marmon "16" Prices Up

INDIANAPOLIS, July 28—An increase in the list price of the Marmon sixteen has been announced by G. M. Williams, Marmon president.

All body styles are advanced $425.00 at the factory, making the list price of the five-passenger sedan $5,200, including all equipment. Other body styles range upward to a price of $5,500.00 for the seven-passenger limousine.

+ + CALENDAR + + OF COMING EVENTS

SHOWS

International Garage Exposition, Berlin Germany .....May 9-Aug. 9

Olympia Passenger Car Show, London .....Oct. 15-24

Olympia Truck Show, London...Nov. 5-14

Passenger Car Show, Glasgow..Nov. 13-21

Motorcycle Show, London..Nov. 30-Dec. 5

CONVENTIONS

S.A.E. Aeronautic Meeting (in conjunction with Natl. Air Races), Cleveland, Ohio .....Sept. 1-3

Eastern States Exposition, Springfield, Mass. .....Sept. 20-26

American Welding Society, Boston, Mass. .....Sept. 21-25

American Electric Railway Assn., Atlantic City, N. J.....Sept. 26-Oct. 2

S.A.E. National Production Meeting, Detroit .....Oct. 7-8

National Safety Council, Chicago, Ill. .....Oct. 12-16

Society Industrial Engineers, Pittsburgh, Pa. .....Oct. 14-16

Transportation Meeting, S.A.E., Washington, D. C. .....Oct. 27-29

American Chemical Society, Buffalo, Aug. 31-Sept. 4

American Society Mechanical Engineers (General Meeting), Kansas City .....Sept. 7-9

W. Va. Motor Transportation Assn., Charleston .....Sept. 11

Society for Elec. Development, New York City .....Sept. 11

Steel Founders Society, Chicago..Sept. 17

American Institute Mining and Metallurgical Engineers—Iron and Steel Division, Boston .....Sept. 21-24

American Society for Steel Treating (National Metal Exposition), Boston .....Sept. 21-25

American Society Mechanical Engineers—Machine Shop Practice, Boston .....Sept. 21-26

American Gear Mfg. Assn., Pittsburgh .....Oct. 15-17

National Hardware Assn., Chicago, Oct. 19-22

American Iron and Steel Institute, New York City .....Oct. 23

American Railway Assn.—Motor Transport Division, Chicago .....Oct. 27-28

American Society Mechanical Engineers—Annual meeting, New York City .....Nov. 30-Dec. 4

American Roadbuilders Association, Detroit, Mich. .....Jan. 11-14, 1932

Aero Shipments Increase

NEW YORK, July 28—Shipments by air mail and express during the first five months of 1931 totaled 4,143,072 lb., according to the Aeronautical Chamber of Commerce of America, Inc. This compares with a total of 3,386,975 lb. for the corresponding period of 1930. Mileage flown during the five months by the 36 lines reporting to the Chamber totaled 14,331,544 miles, an increase of 48 per cent of the corresponding period for 1930, and 91 per cent of the mileage scheduled.

Navy Sets Record In Aircraft Tests

42 Types of Craft Tested By U. S. During 12 Months

WASHINGTON, July 28—The flight test activities of U. S. naval aviation carried out during the year ended June 30 are believed to have been the most extensive ever carried out by any navy in a year.

Forty-two different types of machines were used varying from observation and transport planes to flying boats, bombers and an autogiro.

"The mission of this section is to carry the flight testing of airplanes, engines, accessories and equipment as directed by the department, and to submit proper reports thereon," Rear Admiral William A. Moffett said. "Simply expressed, this means that virtually all experimental machines and the first airplane of each production contract are put through the program of tests and inspections on which is based the acceptance of each type for service use.

"It is fortunate that we have such a fine location for this work, here, close to the design and engineering experts in the department. Because of this, discussions of defects or improvements in our planes encounter a minimum of delay."

Every airplane represents a different problem, but the same general program of tests is applicable to all. A routine test begins with the weighings, both empty and loaded, as a result of which the center of gravity is determined.

Then follows complete photographing, covering not only the airplane with all its equipment in place but also any items of unusual interest or peculiar construction which might be of future value.

The machine is then ready for flight testing—climb, speed, stability, balance and maneuverability.

Finally the guns must be fired while the ship is in the air, the bombing installation must be tested, the radio installation tried in flight, and all miscellaneous equipment and appliances operated to prove their suitability.

Almost every plane has further trials before it can be accepted for service use.

Norman Henry Halliday

Norman Henry Halliday, vice-president of Mack Trucks, Inc., in charge of sales of trailers, died in an Allentown, Pa., hospital, July 16, from appendicitis. He was 47 years old.

Mr. Halliday entered the automotive field as sales manager for John N. Willys, later going with the Mack Trucks as vice-president and division manager of the New England territory.

New!

Now ready—Catalog "H"

The new BARBER-COLMAN Book of Small Tools

We now have ready for mailing Catalog "H"—the new Barber-Colman Book of Hobs, Milling Cutters and Reamers. This 200-page catalog is an entirely different edition than Catalog "G" which it supersedes. It contains not only illustrations and descriptions of all Barber-Colman Small Tools, but also illustrates and describes Barber-Colman Hobbing Machines, Hob Sharpening Machines and Reamer Sharpening Machines. It supplies in handy, convenient form a wealth of valuable information on Hobs, Reamers and Milling Cutters—the hobbing process—data on Spline Shafts—and many valuable formulas and tables.

Your copy of this book will be forwarded promptly upon receipt of your request. Use the handy coupon below, if you wish. Simply fill out, clip and mail this coupon to us and your copy of Catalog "H" will go forward by return mail.

BARBER-COLMAN COMPANY
General Offices and Plant
ROCKFORD, ILLINOIS, U. S. A.

BARBER-COLMAN COMPANY A. I. 8-1-31
ROCKFORD, ILLINOIS, U. S. A.

Please send me a copy of your new Catalog "H" describing Barber-Colman Hobs, Milling Cutters and Reamers.

Name_____ Firm_____
Address_____
City_____ State_____

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

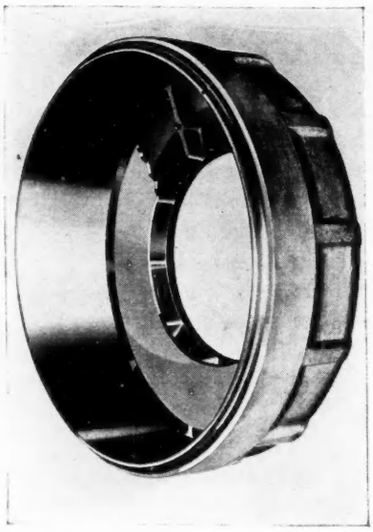
Hisey Improves 6 & 7 in. Grinders

THE commutating type repulsion induction motor is now standard equipment on Hisey 6 and 7 in. grinders, according to an announcement by the Hisey-Wolf Machine Co., Cincinnati, Ohio. Starting current is only about one-third that usually required, so that low voltage due to line drop and other conditions is no longer troublesome. Due to the absence of a dragging centrifugal switch, the motor will start and pick up speed instantly.

Gunite Airblast Brake Drum

A NEW "air-blast" brake drum has been developed by the Gunite Corporation of Rockford, Ill., with the idea of eliminating trouble from overheated brakes and tires.

Radial ribs or fins cast on the inside back face of the brake drum are



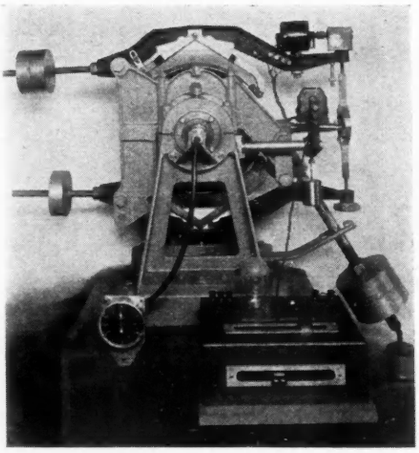
Gunite "air-blast" brake drum

covered with a thin plate, forming a centrifugal fan that draws in cool air through small holes at its smallest diameter and blows it between the drum and lining, over the shoes and upon the tires.

The manufacturers claim that this method of cooling the brake parts at the hottest points, rather than on the outside of the drum, materially improves braking performance and also protects the tires against overheating.

Brake Lining Testing Machine

A MACHINE for determining the coefficient of friction and the life of brake linings is being offered the industry by the American Instrument Co., Washington, D. C. This machine, which was developed by the staff of the Bureau of Standards and used in



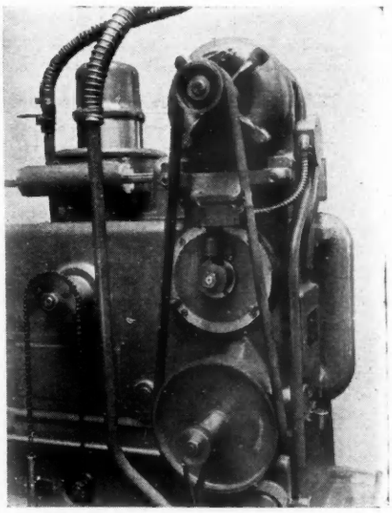
the extensive researches carried out on brake lining there, is illustrated by the photograph reproduced herewith. One of its features is an automatic pressure regulator, which keeps the load on the lining constant during a life test. The testing machine comes equipped with a ring dynamometer by means of which the friction between lining and drum is measured, and a tachometer.

Brown & Sharpe Slitting Saw

BROWN & SHARPE MFG. CO., Providence, R. I., has recently added to its line of cutters twenty-one sizes of metal slitting saws with side chip clearance. These saws of high-speed steel have been developed to increase production and lessen breakage by permitting chips to be carried out of deep slots without jamming. Large chip space is provided; in addition to the pockets at the sides of the teeth, the sides of the saws are recessed and there is also a concavity on the lateral cutting edges. These saws make, at one cut, deep slots which under similar conditions are said to be impractical with an ordinary saw.

Fellows High-Speed Gear Shapers Have Automatic Electrical Control

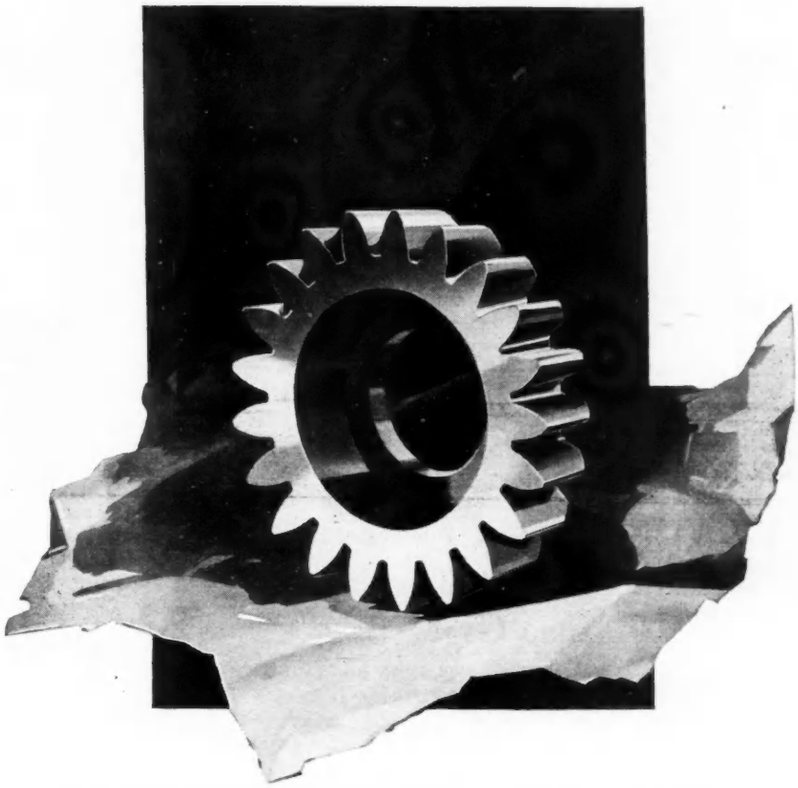
WHEN arranged for motor drive, the Fellows high-speed gear shaper is now provided with an auto-



matic electrical control, according to a recent announcement by The Fellows Gear Shaper Co., Springfield, Vt. The machine is provided with a push button station, mounted on an auxiliary bracket so that all the operator has to do in starting the machine is to push the "Start" button. The machine can also be stopped at any point in its cycle by pushing the "Stop" button. This provides a considerable convenience in setting up the machine.

The machine is stopped automatically when it has finished its complete cycle through an electrical control switch attached to an extension on the rear of the motor bracket. This switch is operated by a plunger, which in turn is acted upon by a cam held on the same shaft as the regular feed cam, and is timed with the latter. When the roll on the saddle operating rack reaches the high point on the feed cam, and just before the roll drops into the depression, the switch operating cam lifts the plunger, breaking the circuit and stopping the machine.

(Turn to page 190, please)



EVERYTHING CENTERS AROUND

THE CUTTER

In the Production of High-Accuracy GEARS

The Fellows Gear Shaper is designed to generate accurate gears. That accuracy is controlled by manufacturing and inspection equipment which comprises the

FELLOWS METHOD

Fellows Gear Shaper methods produce good gears at the lowest cost per O.K'd. assembly because of "Original Fellows" Gear Shaper Cutters. The quality that you must put into a gear is *not* inherent in the Gear Shaper alone, it is secured by *complete Fellows equipment.*

True! You have to learn this by experience. But, the experience can be so costly that you will do well to heed that of others who have put their gear troubles behind them. Talk it over with a Fellows Sales Engineer—he has been "trouble shooting" long enough to be able to tell you how you can save money by consistently using "Original Fellows" Gear Shaper Cutters.

THE FELLOWS GEAR SHAPER COMPANY, Springfield, Vermont, U. S. A. (616 Fisher Building, Detroit, Michigan).

FELLOWS
~ GEAR SHAPERS ~

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

King-Seeley Heat Indicator

A HEAT indicator for automotive use is the latest addition to the line of products of King-Seeley Corp., Ann Arbor, Mich., and an illustration of the instrument is reproduced herewith.

King-Seeley dashboard heat indicator

The indicator is essentially a remote-reading thermometer, the cylinder-head bulb and capillary tube containing a red liquid which expands when heated. The height of the column of liquid in the glass tube is easily read, and the form of the face of the instrument readily distinguishes it from other dashboard instruments. The top of the glass tube is sealed, to prevent loss of liquid through rough handling or evaporation. The liquid will not freeze at low atmospheric temperatures and is not toxic. The capillary tube is protected by the usual helical conduit. The bulb and nut fit the standard opening in cylinder heads.

We understand that this heat indicator has been adopted by a number of large manufacturers for use on the instrument panels of their new models. In appearance the unit matches the gasoline gage and oil-level gage offered by the same company.

Reliance Gas-Heated Soldering Iron

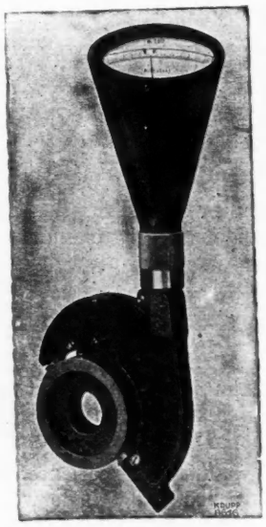
INCREASED economy is one of the features claimed for the "Torchiron" gas-heated soldering iron recently introduced by the Reliance Specialties Manufacturing Co., New York, N. Y. With a 3 lb. head, it requires only 4 or 5 cu. ft. of gas per hr.; with a 5 lb. head, 5 or 6 cu. ft. of gas per hr. It is heated by either natural or artificial gas and low pressure air mixed by means of a needle valve.

Constant temperatures are increased or decreased at the option of the operator by regulation of the needle valve. The copper heads may be brought to a red heat within 3 to 5 minutes after lighting. Coppers are available in sizes ranging from ½ to 5 lb. They also are made to specifications. They are quickly interchangeable, being screwed onto the stainless steel tip. As the name implies, the "Torchiron" may be used as a torch as well as an iron, merely by removing the copper head.

Coats Mikrotast Snap Gage

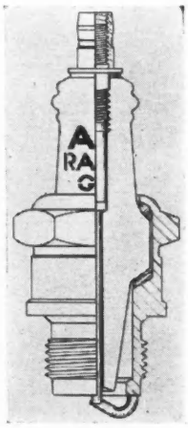
A COMPARATOR snap gage fitted with a Mikrotast indicator was recently placed on the market by the Coats Machine Tool Co., New York, N. Y.

A considerable size range is available through adjustment of the lower anvil towards the snap gage center. Located diametrically opposite to the lower anvil is the upper anvil, representing the free end of a lever actuating the indicator. A torsion spring causes the free end of the lever to contact with the work, but an adjustable yet fixed back-stop effectually prevents the lever from contacting with the work under more than gaging pressure. Through rotation, this back-stop is likewise adjustable in the direction of the snap gage center. At a certain distance from each other, lever, back-stop and lower anvil are faced with two circular tungsten carbide pads each. The four pads on the lower anvil and back-stop assure correct seat on the work. These gages have the advantage of being applicable also to revolving work, the "Widia" tungsten carbide pads resisting the abrasive action of rotating bodies.



AC Radio Spark Plugs

A SPARK plug that improves radio reception in automobiles has been developed by Hector Rabezzana, chief spark plug engineer of the AC Spark Plug Co. With the new plug external devices are not needed to suppress interference.



Sectional view of AC radio plug

A difficulty with the use of radio on automobiles has been that the operation of the ignition system interferes with reception. The regular type spark plugs when sparking within the engine act as small transmitting sets, and each time a spark is produced a clicking noise is heard in the receiver. When the engine is running at normal speed, the clicking noise becomes continuous and makes reception difficult.

By placing a comparatively high resistance in circuit with the spark gap, the oscillatory discharge, which is the cause of the interference, can be suppressed, and the interference thus eliminated. In the AC radio spark plug this resistance is incorporated in the central electrode inside the insulator of the plug.

Low Melting Point Brazing Alloy

HANDY & HARMAN, New York, N. Y., have applied for a patent on a new brazing alloy which they call "SIL-FOS." It contains a small percentage of silver and is described as flowing freely at 1300 deg. Fahr. "SIL-FOS" is recommended where higher melting point base-metal brazing or welding alloys cannot be used without danger of weakening, distorting or destroying the parts adjacent to the joint.

"SIL-FOS" is said to have free-flowing properties, with deep and quick penetration. In addition, at 1400 deg. Fahr. (the flow point of borax flux), there is 100 deg. of superheat which increases the fluidity still further and aids penetration and alloying action.

Another interesting feature claimed for "SIL-FOS" is that it requires less than the usual amount of flux because of the deoxidizing effect of the phosphorus in the alloy. This may tend to reduce the cost of cleaning and finishing after joints have been made.